

**FY2010 Initiative Implementation Plan: Advanced
Simulation Capability for Environmental
Management (ASCEM)
(WBS 1.1)**

March 18, 2010

Prepared by the ASCEM Multi-Lab Program Team

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Summary

The U.S. Department of Energy's Office of Environmental Management (DOE-EM) was established in 1989 to achieve the safe and compliant disposition of legacy wastes and facilities from defense nuclear applications. Because there are technical challenges in meeting this goal, DOE-EM established the Technology Innovation and Development Program to provide applied research and engineering support to the cleanup mission. The objective of the DOE-EM Technology Innovation and Development Program is to reduce the technical risk and uncertainty in the Department's clean-up programs and projects. The Technology Innovation and Development Program efforts are organized using a roadmap approach that documents and identifies:

- the engineering and technical risks DOE-EM faces over the next ten years,
- the strategies DOE-EM will use to minimize these risks, and
- the planned outcomes of implementing those strategies.

Strategic initiatives that address key technical risk and uncertainty in the DOE-EM program have been developed from the roadmap. The initial efforts are being directed toward integrating engineering and technology efforts associated with:

- Tank Cleaning and Closure,
- Long-Term Waste Form Performance Assessment and Analysis,
- Sustainable Groundwater and Soil Solutions, and
- D&D Technology Development and Deployment.

To support the risk reduction effort, DOE-EM, in collaboration with other DOE offices, is leading a multi-institution, multi-disciplinary team of geoscientists, material scientists, and computational scientists from Los Alamos, Lawrence Berkeley, Pacific Northwest, Oak Ridge, and Savannah River National Laboratories to launch a new modeling initiative for Advanced Simulation Capability for Environmental Management (ASCEM). In addition, Argonne, Idaho, and Lawrence Livermore National Laboratories are also supporting this effort. A listing of key participants from these eight national laboratories is shown in Appendix A.

ASCEM is a state-of-the-art scientific tool and approach for understanding and predicting contaminant fate and transport in natural and engineered systems. This modular and open source high performance computing capability will facilitate integrated approaches to modeling and site characterization that enable robust and standardized assessments of performance and risk for EM cleanup and closure activities. The ASCEM program is aimed at addressing critical EM program needs to better understand and quantify the subsurface flow and contaminant transport behavior in complex geological systems. It will also address the long-term performance of engineered components including cementitious materials in nuclear waste disposal facilities, in order to reduce uncertainties and risks associated with DOE EM's environmental cleanup and closure programs. Building upon national capabilities developed from decades of R&D in subsurface geosciences, modeling and simulation, and environmental remediation, the ASCEM initiative will develop an integrated, high-performance, open-source computer modeling system for multiphase, multicomponent, multiscale subsurface flow and contaminant transport. In addition, the integrated model will incorporate capabilities for predicting releases from various waste forms, identifying exposure pathways and performing dose calculations, and conducting

systematic uncertainty quantification. The model will be demonstrated on selected sites and then applied to support the next generation of performance assessments of nuclear waste disposal and decommissioning facilities across the EM complex.

The ASCEM program is part of the Groundwater and Soil Remediation program (EM-32) and will be closely integrated with the other four EM-32 action areas. In addition, ASCEM will incorporate results from the Cementitious Barrier Partnership (CBP) project and evaluation of waste staging/area closure in support of closure of waste tank farms. It will also leverage waste form degradation modeling that is being performed by the Nuclear Energy Advanced Modeling and Simulation (NEAMS) program, as well as the related Office of Science subsurface environmental research and modeling efforts. These interfacing/leveraging activities will be described in detail in an ASCEM Integration Plan to be issued separately.

Background/Description of Complex-Wide Need

In response to a congressional request for R&D funding to support EM cleanup efforts, a roadmap was developed by DOE EM that identified key engineering and technology gaps for the EM programs [1]. In a review of the roadmap, the National Research Council (NRC) of the National Academies provided advice to DOE EM for addressing principal science and technology gaps in the roadmap [2]. Table 1 shows the principal technology gaps identified by DOE in their groundwater and soil remediation program and their R&D priority ranking by the NRC.

Table 1. Principal Science and Technology Gaps and Their R&D Priorities

GS#	Gap	Priority
GS-1	Contaminant behavior in the subsurface is poorly understood.	high
GS-2	Site and contaminant source characteristics may limit the usefulness of baseline subsurface remediation technologies.	medium
GS-3	Long-term performance of trench caps, liners, and reactive barriers cannot be assessed with current knowledge.	medium
GS-4	Long-term ability of cementitious materials to isolate wastes is not demonstrated.	high

To address these gaps, the NRC advised DOE, among taking other measures, to use more sophisticated computational models that better incorporate understanding of site geohydrology and contaminant geochemistry, develop the scientific basis to support delaying remediation activities until there is adequate knowledge to proceed with the remediation (GS-1), and develop robust models of barrier behavior that can incorporate appropriate uncertainty and account for natural and anthropogenic spatial and temporal changes, together with field data to calibrate these models (GS-4). Similarly, the need for developing predictive capabilities using high-performance computing technologies to understand contaminant behavior and to support developing and implementing effective and sustainable remediation approaches has also been identified in DOE internal workshops and reviews [3, 4, 5].

In response to the NAS and internal DOE review recommendations, the DOE Office of EM has launched the Advanced Simulation Capability for Environmental Management (ASCEM) initiative to address key challenge areas including GS-1 and GS-4. ASCEM is a state-of-the-art scientific tool and approach for integrating data and scientific understanding to enable prediction of contaminant fate and transport in natural and engineered systems. The modular and open source high performance computing tool will facilitate integrated approaches to modeling and site characterization that enable robust and standardized assessments of performance and risk for EM cleanup and closure activities. Specifically, the ASCEM initiative is aimed at addressing these critical EM program needs to better understand and quantify the subsurface flow and contaminant transport behavior in complex geological systems and the long-term performance of engineered components including cementitious materials in nuclear waste disposal facilities, in order to reduce uncertainties and risks associated with DOE EM's environmental cleanup and

closure programs. ASCEM will be used to integrate science and technology development efforts within DOE SC and EM to enable prediction of contaminant fate and transport.

Building upon national capabilities developed from decades of R&D in subsurface geosciences, modeling and simulation, and environmental remediation, the ASCEM initiative will develop an integrated, high-performance, open-source computer modeling system for multiphase, multicomponent, multiscale subsurface flow and contaminant transport. In addition, the integrated model will incorporate capabilities for predicting releases from various waste forms, identifying exposure pathways and performing dose calculations, and conducting systematic uncertainty quantification. An illustration of the environmental processes that ASCEM will simulate is given in Figure 1. The model will be demonstrated to selected sites and then applied to support the next generation of performance assessments of nuclear waste disposal and decommissioning facilities across the EM complex.

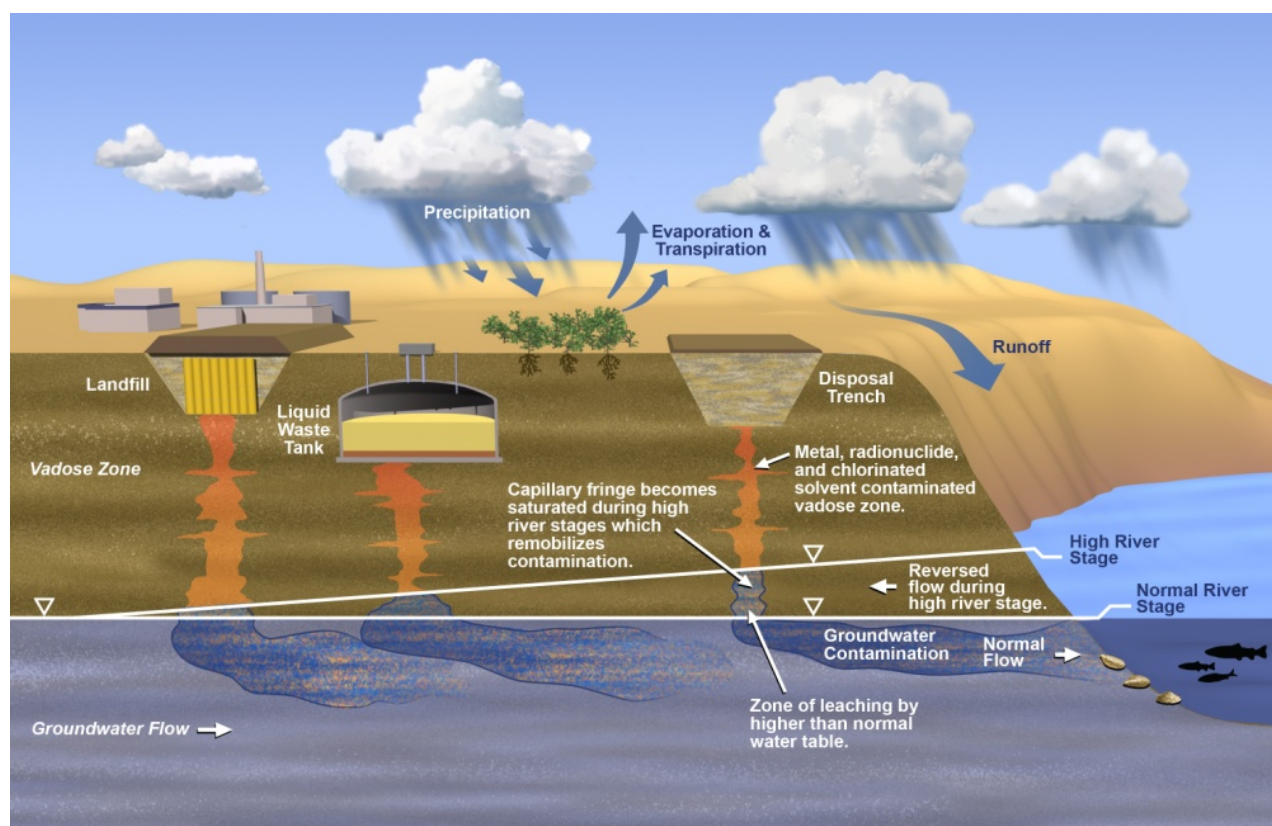


Fig. 1. Typical environmental processes considered in ASCEM.

Major Program Objectives for ASCEM

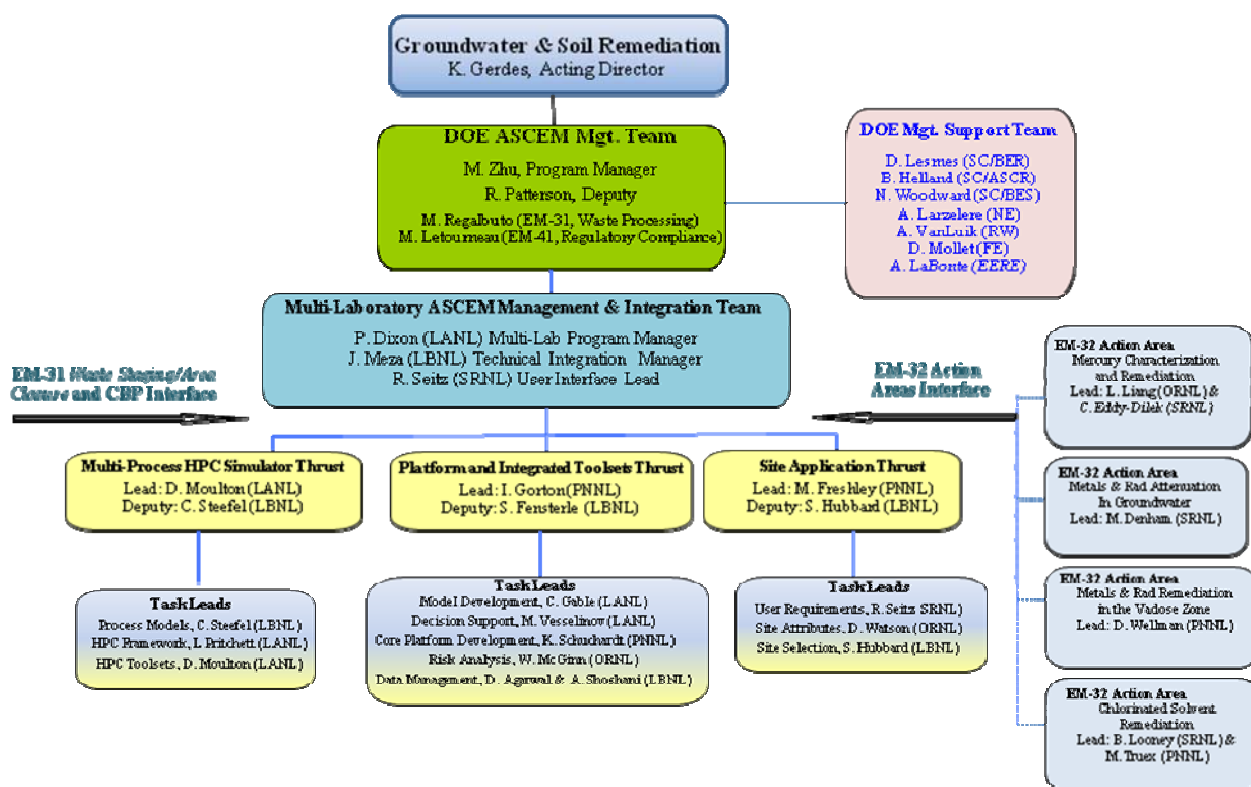
ASCEM is a state-of-the-art scientific tool and approach for integrating data and scientific understanding to enable prediction of contaminant fate and transport in natural and engineered subsurface systems. The modular and open source high performance computing tool will facilitate integrated approaches to modeling and site characterization that enable robust and standardized assessments of performance and risk for EM cleanup and closure activities. This

tool will integrate site characterization and site characterization data to help EM reduce cleanup time and costs, and reduce uncertainties and risks.

Barriers to success (policy, institutional, and/or budget) that need to be addressed as part of project planning and execution are listed below:

- Project activities will need to be coordinated with site performance and risk assessment characterization and scientific investigations to generate data needed for ASCEM validation and verification.
- Integration with site contractors and regulators will be necessary to assure ASCEM products will be used by the remediation contractors to meet regulatory requirements
- The aggressive schedule must assure project activities and deliverables can be completed in time to impact remediation and site closure decisions.
- Additional field activities in EM-32 may be required to generate unique site characterization data to support modeling validation and verification activities.
- Funding profiles need to be maintained to accomplish the programs goals in the aggressive time frames described in this implementation plan.

ASCeM Project Organization



The high level ASCeM Program roles and responsibilities are defined in the “Charter for the Advanced Simulation Capability for Environmental management (ASCeM) Initiative” issued in March 2010.

ASCEM Program Description (WBS 1.1)

The following is a description of the project thrust areas and tasks. The schedule and budgets are captured in a detailed project schedule and budget developed in the Oracle Primavera P6 Enterprise Project Portfolio Management software (Detailed FY10 ASCEM Master Schedule Appendix B, FY10 Total Lab Budgets (Detail at the Activity Level) Appendix C and FY10 WBS Budgets by Activity with Lab Participant Appendix D).

The project Implementation Plan and P6 schedule were the first deliverables for the project as part of the initial planning phase. Three technical project WBS elements (thrust areas) have been identified as an approach to develop the new simulation approach and capabilities for DOE EM (see Detailed FY10 ASCEM Master Schedule Appendix B). These thrust areas by WBS elements are: 1.1.1 Platform and Integrated Toolsets, 1.1.2 Multi-Process HPC Simulator, and 1.1.3 Site Applications. In addition, WBS element 1.1.4 describes the ASCEM Management structure and responsibilities.

The due dates for the deliverables described in this plan are the dates on which the documents are to be delivered to DOE EM for final review and acceptance.

WBS 1.1.1 Platform and Integrated Toolsets Thrust Area

Creating models for understanding and predicting contaminant fate and transport in natural and engineered systems is a highly complex task. It requires the collection, management and analysis of large and diverse data sets, and a thorough understanding of modeling and simulation tools. The purpose of the Platform and Integrated Toolset thrust is to provide data management and model development and analysis tools that can be used to exploit the advanced simulation capabilities for the solution of environmental management problems.

The Platform will provide a computational environment that facilitates the complex process of model development and code application to a given site and problem. The computational environment will provide a set of tools incorporated into a consistent user interface that permits a modeling approach that is flexible, maintains quality assurance procedures and data integrity, and increases user efficiency. Specific capabilities provided by the platform include toolsets for advanced information and data management, parameter identification, uncertainty quantification, decision support, risk assessment and data visualization. The platform will be designed to allow seamless interfacing with the new HPC simulator that will be produced by ASCEM and will also interface with open source and commercial modeling tools that are important to pre- and post-processing the HPC models. As a secondary goal, existing flow and transport modeling software will also be supported by the platform.

In FY10, we will focus on the core platform user environment, data management, integration with the HPC simulator, and initial investigations and prototypes of toolsets for model development, visualization, decision support and risk analysis. This will result in a prototype that will demonstrate how site users can interact with the Platform including: storing and retrieving data, and creating, simulating and visualizing a computational model that provides inputs to

decision support and risk analysis tools. The five tasks in the Thrust that will achieve this work are described below.

Platform challenges to be addressed:

- Handling large amounts of heterogeneous data involved in model creation and analysis.
- Incorporating a wide range of 3rd party tools into the modeling process.
- Quantifying uncertainty in models.
- Integrating decision support and risk assessment into the modeling lifecycle.

Platform Thrust Area Milestones / Deliverables:

Milestone	Due Date
ASCEM Draft Project implementation plan	January 27, 2010
ASCEM Final Platform implementation plan	March 19, 2010
Platform requirements document	May 14, 2010
Platform design document	July 15, 2010
Platform component demonstration	October 14, 2010
ASCEM Phase 1 Prototype Demonstration	December 17, 2010

Core Platform Development Task (WBS 1.1.1.2)

This task focuses on creating a prototype environment that allows site applications users and modelers to interact with the Platform, create, share and manage site models, and interact with Platform toolsets (e.g. Risk Analysis, Decision Support, Parameter Estimation and Uncertainty Quantification) and third party commercial/open source tools. The objective is to leverage existing software tools and work with the Site Applications requirements task to extend our tools to demonstrate meeting the needs of EM sites. This will involve designing a core software architecture consistent with requirements that can meet the existing and future needs of the Platform and integrated modeling and analysis toolsets. We will also design suitable integration interfaces to allow the Platform to share data and models with existing commercial and community tools used in modeling, and interact with the data management and simulator execution tools.

The initial sub-tasks, in conjunction with the HPC Core and Site Application Thrusts, will focus on eliciting and documenting the Platform requirements and prototyping various features so that users can experiment with various concrete approaches that could be pursued to build the Core Platform. Based on these requirements, we will design the Platform architecture and define how the Core Platform interfaces with other tasks in ASCEM. A key component of this design includes how the Platform integrates with the data management system, HPC Core simulator, existing tools used in DOE-EM sites, and the various ASCEM toolsets for conceptual modeling, parameter estimation, model setup, visualization, uncertainty quantification, decision support and risk analysis.

We will then commence implementing the initial version of the Core Platform, and concurrently put in place a test environment that can be used by the whole Platform

Thrust for validation and verification (V&V). As test data sets become available from the Site Applications Thrust, we will enhance the initial implementation so that a demonstration of the Platform and its associated toolsets and data management systems can be undertaken. This will demonstrate how the Core Platform provides the flexible, scalable and secure user environment and tool integration infrastructure for the development activities that will be undertaken in ASCEM in subsequent years.

Data Management Task (WBS 1.1.1.3)

To ensure consistency, reproducibility, and traceability of ASCEM analyses, it is critically important to effectively manage the staging and movement of data, and to ensure that input data are ready and available to a computation and that output is stored in the right location along with the corresponding metadata and provenance information.

The purpose of this task is to develop a data and information infrastructure that is accessible to all the toolsets of the ASCEM Platform. The data will range from a variety of disparate site characterization data, parameter databases, conceptual and numerical models for sites, and inputs and outputs from a multitude of simulations executed on the HPC Core Framework. Model input data along with site characterization information needs to be organized, versioned and easily accessible for use in conceptual and numerical model creation and parameter estimation. An important component of this task will be the development, in conjunction with the HPC core, of a data model that handles both site characterization data and simulation results.

During the first year (FY10), the effort in this task will develop requirements, design the data management system, and develop the demonstration data management system components needed to support the initial site demonstrations. Our initial focus will be on developing an inventory of the types of data and data formats that need to be managed along with the data interaction requirements. We will work closely with the HPC Simulator for Multi-Process Models thrust, the Site Applications thrust, and EM performance assessments and risk users to document and prioritize the data types and interactions based on availability and the needs of the other ASCEM components. The data and information management system will be designed based on the full range of requirements. Individual data management capabilities will be implemented incrementally based on the priorities and the needs of the site demonstrations.

During the design and implementation of the data and information management system we will begin work with the site application thrust to identify the specific data that needs to be in the data management system to support the initial demonstrations and perform needed analyses to prepare the data and ingest it such as interpolation, gap-filling, assimilation, characterization, etc. We will also begin work with the HPC thrust to implement the data management interfaces needed to interact with simulations and visualizations. Workflow and data analysis mechanisms will be implemented as needed to support simulation execution for the site demonstrations. This first year of the project will focus on incorporating existing data management and workflow mechanisms where possible.

Model Development and Analysis Task (WBS 1.1.1.4)

This task is made up of four parts. These are 1) Mesh generation and model setup, 2) Visualization, 3) Parameter estimation and 4) Uncertainty quantification. During the first year (FY10) the focus will be on development of requirement and design documents, as well as implementation plans for out years. However, an operational prototype will also be delivered as part of a demonstration project.

Mesh generation and model setup will provide the tools by which the researcher can turn the site conceptual model into a model specification ready to be simulated on the HPC Core Framework.

The tools will provide the following functions:

- specification of the model components (e.g., hydrological, chemical, biological, etc.) corresponding to the physical processes to be modeled;
- import or generation of the computational grid;
- specification of initial and boundary conditions;
- parameterization of the model;
- specification of the model output variables and their output frequency and format.

The visualization toolset will be designed to support conceptual model development and model setup through the visualization of parameter distributions and simulation results, including their uncertainties. Moreover, visualization can be used as a diagnostic tool during code development and debugging. A key issue to resolve early in the project is how to export aspects of the site conceptual model from commercial geomodeling tools into the open source visualization tools that will be a part of the platform. Being able to do so is necessary in order to visualize the output of HPC simulation codes within the context of the site conception model and in combination with the results of the uncertainty quantification models. In the future, we intend to implement automated visual output from the HPC simulations in order to provide standard visualizations (views) of simulations as the starting point for additional integration with the simulation data. We will work with the modelers to define what the standard views should be and with the data management task to ensure that the visual output of the simulations is captured as part of the metadata that describes the simulations. Our initial focus, however, will be on generating a prioritized set of user requirements for visualization of simulation results and developing prototype visualizations of simulation results from one or more existing subsurface simulation codes to show the use of different visualization techniques and the effect of combining different variables in a visualization package.

The development of the Parameter Estimation toolset will begin by (1) identifying key parameters that likely need to be determined using parameter estimation techniques, (2) identifying key observation types that are likely to be used for parameter estimation, (3) defining an objective function that measures the misfit between calculated and observed data, (4) selecting one or two optimization algorithms considered robust and effective for solving the inverse problem at hand, (5) examine interfaces to other Platform toolsets

(specifically data management, model setup, execution, visualization, and uncertainty quantification) and the HPC core (specifically the use of methods to efficiently calculate sensitivity coefficients), and (6) implementing, using existing forward models and existing optimization routines, the parameter estimation workflow for Platform demonstration.

The uncertainty quantification tools will have links to the conceptual model development and data management and visualization elements of the Platform in order to provide tools for management of multiple conceptual and numerical models of a particular site through capturing and maintaining metadata regarding the relationships among multiple simulations and providing visual depictions of those relationships. While multiple algorithms exist (Latin Hypercube Monte Carlo, Markov Chain Monte Carlo, sparse grids, calibration-constrained null-space Monte Carlo, response-surface approximation, realization screening methods), in the first phase only one or two will be implemented depending on what is most appropriate for the demonstration problem.

Decision Support Analysis Task (WBS 1.1.1.5)

The goal of this task is creating a prototype toolset that facilitates the decision making by site applications users, modelers, stakeholders, decision and policy makers. The approach is to leverage existing theoretical methods and software tools. We will work with the Site Applications requirements task to demonstrate meeting the decision making needs of DOE-EM in general as well as the needs of specific EM sites.

The first sub-tasks will focus on review of the existing methods and software tools for decision making, eliciting and documenting the design requirements. Based on the prepared design requirements documents, we will design the decision-support architecture. We will also define interfaces with other tasks in ASCEM. A key component of this design includes how the decision-support toolset communicates with the data managements, conceptual modeling, parameter estimation, model setup, visualization, uncertainty quantification and risk analysis toolsets of the Platform. Also critical will be the integration with the management system, HPC Core simulator, and existing tools used in DOE-EM sites.

Then we will initiate the development of the first version of the decision-support toolset so that it integrates with the Core Platform, Data management and other toolsets where needed. As test data sets (synthetic and site-specific) become available from the Site Applications Thrust, we will further improve the initial implementation of the decision-support toolset.

Risk Analysis Task (WBS 1.1.1.6)

The objective of the risk toolset is to provide a comprehensive risk resource enabling the flexibility/adaptability to support all regulatory environments (or other basis for decisions) as well as synthesize risk with other primary data/information components in support of data collection and decision processes. The risk assessment module will

provide data, tools, and guidance to enhance the integration of ecological and human health risk in the EM decision process. The risk toolset will include a repository for DOE and regulatory guidance, standard risk parameters, data, risk tools as well as user support to facilitate analyses of impacts from current and future exposure to contaminants of concern to human health and ecological endpoints. The risk module will utilize currently approved (EPA, NRC, DOE) risk methods, models, and toxicity values as well as integrate the latest research in these areas. Our approach is to utilize and build on existing risk tools and models to address user needs identified through the Site Application process.

The initial tasks in the development of the Risk Analysis Toolset will focus on the identification of user requirements as a basis for prototyping existing data and tools. Specifically, this task will work in conjunction with the Site Application Thrust to elicit input from DOE EM complex field operations/office personnel and their contractors (i.e. risk assessment staff) to determine their requirements regarding risk data and tools as well as improving the application to decisions. This task will include a comprehensive review of available and relevant guidance, risk calculation tools such as the RESRAD family of codes, exposure parameter databases, chemical/physical properties databases, toxicity data, screening data and application tools in the context of EM needs. Through the needs assessment (i.e. comparison of requirements to current data/tools) process we will determine a prioritized set of risk-assessment user requirements as well as gaps in guidance, tools, and data which will serve as the basis for activities in ensuing years. The design of the prototype risk toolset will be based on those requirements that can be addressed near term with available data and tools. The prototype will provide a development environment serving as the foundation and enabling improvements to subsequent modifications and additions to the toolset. A critical component of the prototype design will be the identification and development of points of integration between the risk module and the HPC Core simulator as well as the other ASCEM toolsets (i.e. visualization, uncertainty quantification, decision support).

The development of the prototype risk toolset will ensue with the completion of the needs assessment and prototype design. The prototype of the Risk Analysis Toolset will incorporate available data, models and tools within a development environment to test design concepts intended to support user interface and integration with other ASCEM modules. The testing process will include a feedback component to ensure targeted and measured improvement to the prototype prior to demonstration. The demonstration will focus on user requirements and the integration needed to provide a sound foundation for activities in subsequent years in support of the improved application of risk information to the decision process.

WBS 1.1.2 Multi-Process High Performance Computing (HPC) Simulator Thrust Area

The Multi-Process High Performance Computing (HPC) Simulator will provide a flexible and extensible computational engine that will simulate the coupled processes and flow scenarios described by the conceptual models developed using the ASCEM Platform. These conceptual

models span a range of process complexity, potentially coupling hydrological, biogeochemical, geomechanical, and thermal processes and will be used to quantify the associated uncertainty, sensitivity, and risk. The first task in the HPC Simulator for Multi-Process Models thrust is Process Models. This task focuses on the mathematical descriptions of the relevant processes. The HPC Simulator itself is composed of the HPC Core Framework and the HPC Toolsets. The HPC Core Framework task will develop the Multi-Process Coordinator (MPC) as well as underlying low-level services, such as parallel I/O and data structures. The HPC Toolsets task will develop the essential building blocks (modules) for the process models, including grids, advanced discretizations, multiscale techniques, and nonlinear/linear equation solvers.

There are three high level objectives for this year. First, we will document the requirements for the HPC Simulator based on input from the Site Thrust and the needs of the Platform. Second, we will develop the initial design of all aspects of the HPC Simulator. Finally, we will develop initial prototypes of the flow, transport, and geochemistry modules, and perform an initial demonstration of these as decoupled processes.

HPC challenges to be addressed:

- Development of a scalable simulator across a wide range of architectures.
- Implementation of new algorithms to handle multi-scale, multi-process phenomena.
- Accurately capture the influence of highly heterogeneous media, e.g. fast paths and fractures, dead end (no flow) pore space on flow and reactive transport processes.

Multi-process HPC Thrust Area Milestones / Deliverables:

Milestone	Due Date
ASCEM draft project implementation plan	January 27, 2010
ASCEM final HPC implementation plan	March 19, 2010
Requirements document for Process Models	May 14, 2010
Requirements and draft design for HPC Core Framework and Toolsets	July 15, 2010
Complete prioritization and summary report of Process Models	October 14, 2010
Initial prototype of flow and geochemistry modules	October 14, 2010
Phase 1 demonstration of flow/infiltration, transport, and geochemistry modules	December 17, 2010

Process Models Task (WBS 1.1.2.2)

At the highest level of the HPC Simulator design is a set of process models that mathematically represent the physical, chemical, and biological phenomena controlling contaminant release into, and transport in, the subsurface. The Process models task is focused on providing the detailed mathematical description (models) of the relevant subsurface processes. This concise mathematical description and accompanying analysis, provides critical information for requirements and design of both the HPC Core Framework (Task 1.1.2.2) and the HPC Toolsets (Task 1.1.2.3).

The Process Models task will include process models for (1) source term behavior, i.e., to predict the performance of residual wastes in closed tanks, cribs, trenches, and landfills and degradation of waste forms and engineered barriers, and (2) subsurface flow and reactive transport, i.e., to predict the flow and reactive transport behavior of contaminants released from the engineered barrier into the vadose zone and groundwater. We have categorized these processes to aid in the development of requirements and prioritization. The preliminary categories are:

- Source Terms
- Infiltration
- Flow and Transport
- Bio-Geochemical
- Non-isothermal
- Geomechanical

We will work with the Site Attributes task Element 1.1.3.2 to develop a comprehensive list of processes in each of these categories. We will investigate leveraging existing efforts in key areas, such as the Cementitious Barrier Project (CBP) for geochemical and geomechanical degradation of concrete disposal facilities, modeling efforts tied to waste staging and area closure for EM-31 and the Nuclear Energy Advanced Modeling and Simulation (NEAMS) program for degradation of glass waste forms. We will work with the Select Demonstration Sites task (WBS Element 1.1.3.3) to develop a prioritized list of process models. Based on this prioritized list we will develop the requirements document for the Process Models. This will provide a graded presentation of process models, from simple to complex, in each category. Models with the highest priority will be presented with the greatest detail. Evolution of the list of processes is inevitable, and the modular design of the HPC Simulator will accommodate easily the addition of new process implementations.

HPC Core Framework Task (WBS 1.1.2.3)

This task focuses on the key infrastructure that facilitates the modular design of the HPC Simulator, as well as its portability and its graded Quality Assurance program. This task has four key activities:

- HPC Core Infrastructure
- Testing, V&V, and Benchmarking
- Portability and Performance Tuning
- Multi-process Coordinator (MPC)

Existing HPC Frameworks will be investigated to identify tools, algorithms, and techniques that may be leveraged in each of these activities.

The HPC Core Framework infrastructure task provides a number of low-level services for the HPC Toolsets (Task Element 1.1.2.3), which provide the building blocks for the process models. These include data structures, parallel input/output capabilities,

application programming interfaces and HPC related visualization support. In addition, it provides a unified hierarchical approach to testing, verification and validation, and benchmarking in order to ensure the reliability and robustness of the HPC Simulator. At the lowest level of the hierarchy, unit tests of individual models will be used to verify the correctness of specific sub-modules. At higher levels various integrated tests will be designed to span multiple coupled processes. Finally, at the highest level benchmarks will be developed or gathered from the community that captures realistic site-application scenarios. Similarly, the portability and performance tuning activities will ensure that the HPC Simulator runs well on a wide range of platforms, from laptops to supercomputers. This activity will leverage an automated build process in conjunction with automated testing and reporting to ensure a reliable capability is available on all required platforms. Together these two activities will provide critical support for the graded QA program planned for ASCEM.

The coupling of multiple processes in the HPC Simulator, including flow, transport, geochemical and geo-mechanical processes is both a technical and software engineering challenge. We will develop a Multi-process Coordinator (MPC) to manage this important challenge. The MPC will be responsible for coupling the flow, transport and chemistry modules, or different “processes” more generally, for a given spatial and temporal discretization. The MPC will provide user options that will control the level of coupling necessary to preserve accuracy and attain computational efficiency. The MPC reduces complexity of the implementation, and results in more flexible, reliable, reusable software.

During this first year we will develop the requirements and design of all elements of the HPC Core Framework. In addition, we will develop the services necessary to support the initial prototype development and demonstration of selected HPC Simulator capabilities.

HPC Toolsets Task (WBS 1.1.2.4)

The HPC Toolsets provide the building blocks that transform the mathematical description of the process models into a discrete form suitable for simulation on a computer. The activities in this task are aligned with the three toolsets: meshing, discretization, and solvers. In each toolset, we will leverage existing algorithms, techniques, and implementations, where appropriate.

The mesh provides an essential and fundamental data structure that bridges the conceptual site model and the numerical methods, and is ultimately the building block that connects the resulting simulation with the computing hardware. In the Meshing Toolset we will work with the Site Applications tasks (Elements 1.1.3.2, 1.1.3.3) and Process Models task (Element 1.1.2.1) to prioritize the development of mesh data structures and refinement options. It is anticipated that these may include, structured meshes that are fit to stratigraphy, as well as unstructured meshes.

The Discretization Toolset is composed of several modules, including spatial and temporal discretization, geochemical reactions, and multiscale techniques. Using these

modules as fundamental building blocks we create process models. The coupling of processes is then managed by the MPC. We will work with the Process Models task (Element 1.1.2.1) and the Meshing Toolset to develop the requirements for these modules and their interfaces. Based on these requirements we will select the appropriate methods, and establish a staged development plan. To integrate with the ASCEM Platform, a requirements and development plan for additional features will be developed. These features may include model gradients for optimization, adjoints for data assimilation, and augmented systems for direct evolution of parameter sensitivities.

In the Solvers Toolset we treat the nonlinear systems of equations that arise throughout Environmental Management applications, from the time evolution of discretization and geochemical reaction networks, to optimization and assimilation. We will work with the relevant modules in the Discretization Toolset, the Platform (Element 1.1.1), as well as the Process Models task (Element 1.1.2.1), to develop the requirements for the Solvers Toolset. In the case of nonlinear and linear solvers we will leverage existing tools, particularly multilevel solvers, wherever possible. The efficiency of the many linear solvers depends on the development of pre-conditioners. In this activity we will design pre-conditioners based on well-established principles and the unique capabilities provided by the MPC.

This year we will develop the requirements and design of the HPC Simulator toolsets. In addition, we will develop an initial prototype and Phase 1 demonstration of the flow, transport, and geochemistry modules.

WBS 1.1.3 Site Applications Thrust Area

The Site Applications thrust area will provide site data for model development and testing and a linkage between the computational capabilities and specific DOE EM sites where cleaning up legacy wastes and managing disposal activities will require advanced modeling. A key aspect of the thrust will be to establish and maintain linkages with end users. The Site Applications Thrust Area will also provide feedback for developing the HPC and Platform components based on user experience and to disseminate information and provide training.

The Site Applications Thrust includes tasks to establish an interface with end users and solicit input to the requirements for development of the HPC and Platform, establish attributes for potential demonstration sites and make site selections, assemble data for site demonstrations in collaboration with working groups formed at the sites and perform demonstrations. Application protocols for the ASCEM toolset and training as well as a plan for long-term maintenance of the capability are part of the Site Applications Thrust. The first three tasks for user interface and site application will be the focus of activities in FY 2010.

The User Requirements Interface Task includes interviews with site users and a survey of the current practices in performance and risk assessment, including description of modeling tools and approaches, processes represented in the conceptual and numerical models, and gaps in site data and simulation capabilities. This task will be responsible for interfacing with the Low-Level Waste Disposal Facility Federal Review Group and other user communities.

A list of candidate sites for demonstration of the Platform and HPC core will be developed with input from the end user community. The candidate sites will be screened and additional site detail developed on site attributes. Data and previous modeling will be inventoried and prepared for selecting the demonstration sites. The sites for demonstration of ASCEM will be selected in collaboration with the Platform and HPC thrusts and with input from the user community. A plan will be developed for the initial demonstration describing site characteristics, problem to be simulated, and ASCEM components to be highlighted. A working group will be formed to engage end users (site contractor staff) around the demonstration problem.

Site Applications challenges to be addressed:

- Engaging the end user community.
- Range of approaches for performance assessment and remediation modeling.
- Data availability to support detailed modeling may require some new field characterization.
- Range of data format and quality to support modeling.

Site Application Thrust Area Milestones / Deliverables:

Milestone	Due Date
ASCCEM Draft Site Applications Implementation Plan	January 27, 2010
ASCCEM Final Site Application Implementation Plan	March 19, 2010
Input to Platform and HPC requirements document	April 30, 2010
Select Phase 1 demonstration data set	June 11, 2010
Summary report of current performance assessments and site modeling approaches	June 30, 2010
Final summary report on demonstration site attributes	December 3, 2010
Phase 1 demonstration complete	December 17, 2010

End User Requirements Task (WBS 1.1.3.2)

This task focuses on reaching out to DOE EM performance assessment and risk assessment users and to scientists involved in other modeling and research activities at DOE Sites. The objective is to collect information that will contribute to efforts to develop requirements documents for the Platform and HPC Thrust Areas and to support identification of demonstration problems to be considered in subsequent tasks in the Site Applications Thrust. Consistent with the nature of tasks in the Platform and HPC Thrust Areas, two levels of information will be obtained:

- 1) Higher-level implementation-related information that will support key tasks in the Platform Thrust (e.g., regulatory and programmatic considerations, implementation of graded and iterative approach, user interface suggestions) and
- 2) More detailed technical information that will support conceptual model and data related tasks in the Platform Thrust and identification of modeling needs for the HPC Thrust (e.g., environmental conditions found at different sites, engineered

features being used, data availability, conceptual models and modeling approaches, and specific processes that need to be considered).

The first subtask will entail interviews with site users and a review of existing documentation for DOE sites. This subtask will seek the information described in items 1 and 2, which will be documented in a summary report that will serve as a resource for requirements development and for identification of demonstration projects. In addition to collecting the information above, emphasis will be placed on identifying key areas where improvements are needed (e.g., areas where simplifying assumptions are consistently being made resulting in overly conservative approaches) and gathering suggestions from users regarding available data sets and potential demonstration problems to be considered in Tasks 1.1.3.3 and 1.1.3.4. The goal will be to use resources involved in ASCEM at key sites to conduct the interviews.

The second subtask will be to support integration of User needs into requirements documents being prepared for the Platform and HPC Thrust Areas. This task will involve iterative feedback with Thrust and Task Leads to ensure initial development plans will address agreed upon User needs. This task will also provide input to help direct early demonstrations of the tools to include elements that reflect User expectations.

The third subtask will involve on-going interactions with the LFRG, PA Community of Practice, Cementitious Barriers Partnership Project and other user oriented groups within the DOE Complex. This task will provide a means for continuous feedback regarding ASCEM as the project moves forward. This task will also be closely integrated with the User Steering Committee.

Establish Demonstration Site Attributes Task (WBS 1.1.3.3)

This task will be performed to identify and determine the attributes of potential sites that will be considered for demonstration of the platform and HPC core. Site applications will test and help refine Platform tools and modeling capacities, ranging from examining the HPC core performance to various pre- and post-processing tools, Uncertainty Quantification (UQ) and risk assessment modules. To facilitate testing and refinement of the platform tools and modeling capacity, the availability of quality-checked multi-scale and multi-process datasets, site conceptual models and access to previous numerical modeling efforts will likely be key criteria used in the site selection process. Data sets from the sites may also be used for model testing, validation and verification of individual components of the model. Because the hydrogeologic, geochemical, and microbial conditions of the sites also plays a significant role on contaminant fate and transport, a listing of sites with different representative site conditions will be identified (e.g., humid vs. arid; porous granular vs. fractured rock materials; saturated vs. unsaturated, pH, background and contaminant geochemistry, as well as other site conditions; subsurface contamination vs. waste behavior in tanks and landfills). In many cases, availability of such datasets and insights will heavily rely on investments that have already been made by EM (e.g., user groups identified in WBS Task 1.1.3.1 (see Appendix B) and SRNL site) and SC (e.g. IFRC's and SFA's).

With input from Task 1.1.3.2 a list of candidate sites will be developed. More detailed information on the promising sites will be collected including the amount and quality of data available from the sites, the status of conceptual model development, the environmental setting, the processes active at the site and how well they are understood, existing model grids that could be easily imported, and etc. A report will be prepared describing the attributes of the candidate sites. The report will include a matrix summarizing the attributes of the site.

Task 1.1.3.2 will work in parallel with the Platform and HPC thrust representatives to identify the important and relevant attributes for testing the candidate problems using ASCEM, based on their estimates of when and to what extent particular tools will be ready for testing.

Select Demonstration Sites Task (WBS 1.1.3.4)

This task focuses on identifying ASCEM demonstration problems and sites and developing associated draft demonstration plans. A graded approach will be used, where some demonstrations with limited data sets may be chosen to highlight particular ASCEM module whereas another may be chosen that utilizes several ASCEM components. The first subtask will be to prioritize the candidate demonstration sites. The prioritization will consider the matrices of site characteristics that were developed in Task 1.1.3.2; identify site-specific problems that would be tractable to explore and that would be of interest to EM; and assess the potential of a site/problem for illustrating the prowess of ASCEM relative to existing capabilities. Once a subset of candidate demonstration site/problems are identified, the second subtask will entail meeting with potential partners to discuss the possibility of collaboration with ASCEM on a demonstration. These partners might include site contractor staff, researchers who have collected datasets or are involved in modeling at the candidate site, EM program managers, and others such as regulators. The intent of the meetings will be to explore the level of interest, potential cooperation, and leveraging that might exist for the candidate demonstrations and to resolve outstanding questions associated with the candidate problem. In parallel, the second subtask will focus on working with the Platform and HPC thrust representatives to document the feasibility for testing the candidate problems using ASCEM, based on their estimates of when and to what extent particular tools will be ready for testing.

The outcomes of efforts described above will be used to select a data set for completing a Phase 1 demonstration of the Platform and HPC core in December, 2010. The task will develop a short list of additional sites for future demonstrations that will be further evaluated in 2011. The list of candidate demonstration sites will ideally include a few focused demonstrations that are smaller in scope and that will be performed during the early project years as well as one or more comprehensive demonstrations that will be performed in project out-years.

WBS 1.1.4 ASCEM Project Management

(Project Controls, QA and Communications)

The ASCEM project represents a significant systems development and integration effort involving a state-of-the-art framework to facilitate applications, a computational architecture, and analysis components. The project's complexity, outcomes, multi-institutional team composition, and product delivery schedule demands a disciplined management approach to assure success. The management structure of the project is designed to assure effective integration and delivery. It is based upon best practices recommended by the Project Management Institute (PMI), which have been adopted by EM to address past challenges and deficiencies in management of complex projects, and the extensive experience of the core laboratories in managing complex EM, RW, SC and other DOE projects and programs.

The Multi-lab Management and Integration Team will assure management and integration of the overall ASCEM project. The ASCEM project will be led by the management and integration team comprised of a dedicated Program Manager, the Technical Systems Integration Manager, the Technical Thrust Area leads and their deputies, and the User Community Interface lead. The Management and Integration team is supported by business operation functions including Communications and Website Systems, Project Controls and Business Management, Quality Assurance (QA), and Environment, Health, and Safety (ES&H).

The Program Manager (PM), nominated from one of the core laboratories and approved by the DOE ASCEM management, provides the single point of contact and overall interface responsibility to the EM-HQ ASCEM Program Manager at DOE. The Technical Systems Integration Manager is responsible for overall project technical leadership and integration across the three technical thrusts. The senior representatives from the core laboratories will be responsible for delivering needed laboratory resources to the project, including additional technical expertise to address technical gaps and emerging issues. The Thrust Area Leads are responsible for technical leadership, planning and execution of the scope within their designated thrusts. The User Community Interface lead serves as primary project interface with the User Community. The Management and Integration Team, with support from the project operations staff (i.e., communications, project controls, and QA), will assure effective project management, including disciplined project planning, execution, reporting, and change control requests. Together, the Management and Integration Team will assure that the project is planned and implemented effectively to deliver the desired outcomes on schedule.

Program Reviews

To develop ASCEM into a technically meritorious, impactful, and robust program that will make an important contribution to the reduction of risk and cost in EM cleanup and closure activities, DOE ASCEM management will conduct peer reviews of key planning documents and deliverables. Subject matter experts who are external to the ASCEM project team will perform the reviews. The Multi-lab ASCEM Management and Integration team will provide technical support to the reviews upon DOE request.

Leveraging DOE Resources

To allow the rapid deployment of ASCEM, the project is leveraging the efforts of other science and computing initiatives within DOE to strengthen and enhance the project. The following is a listing of the leveraging efforts and collaborations that are currently underway. All of these efforts will allow the ASCEM team to quickly advance a PA/RA tool for use in EM while leveraging the investments that DOE and other Federal and state agencies have made in HPC and environmental modeling.

- 1) One of the most important efforts is with the DOE Office of Science's Environmental Remediation Science Program (ERSP). We will collaborate with ERSP in the areas of modeling and high performance computing, geohydrology, geochemistry, geophysics, microbiology, and remediation. We will also use the data-rich SFAs and IFRCs to allow testing and demonstration of the ASCEM toolset with high quality data.
- 2) We will also capitalize on the SciDAC (Scientific Discovery through Advanced Computing) program through the HPC software infrastructure development, numerical libraries, data management and visualization efforts.
- 3) Since one of the major goals of ASCEM is to produce the next generation of performance and risk assessment tools for DOE EM, we are working closely with the DOE Office of Health, Safety and Security (HSS) to ensure the performance and risk tools being developed are internally consistent with the regulatory practices being overseen by DOE. The ASCEM team is also working closely with former Yucca Mountain PA specialists to leverage lessons learned and expertise to support the next generation EM PA toolset.
- 4) The DOE Office of Nuclear Energy has a small HPC modeling effort in the area of source term and waste form modeling as part of their Nuclear Energy Advanced Modeling and Simulation (NEAMS) effort. With the integration of EM-31 waste staging and area closure efforts into ASCEM, we will work with DOE-NE to leverage our combined efforts to reduce duplication of effort.
- 5) The DOE National Nuclear Security Administration's Accelerated Strategic Computing (ASC) Initiative has invested heavily over the last ten years in developing HPC capabilities. The ASCEM project is utilizing former ASC personnel, leveraging existing experience on UQ (uncertainty quantification), V&V (verification and validation), model development, and large-scale simulation. These efforts strengthen ties to research efforts on HPC multi core computer architecture, modeling and advanced numerical methods that are being developed at the nations national laboratories.
- 6) DOE-EM is a cooperating federal agency in the Federal Interagency Steering Committee on Multimedia Environmental Models (ISCMEM) and Interstate Technology and Regulatory Council (ITRC) working group. The ASCEM team is collaborating with other Federal and state agencies through this collaboration to leverage relevant HPC and environmental modeling work.

Management Milestones / Deliverables:

Milestone	Due Date
ASCEM Draft Project Implementation Plan and Schedule	January 27, 2010
ASCEM Final Implementation Plan and Resource Loaded Schedule	March 19, 2010
Monthly schedule and budget status reports (15 th of each month)	Ongoing
Final QA/SQA implementation Plan	March 26 2010
Draft user steering committee charter	February 12, 2010
First user steering committee meeting	Fall 2010

Appendices A, B, C and D provide the schedule, work scope activity, budget and personnel details for the ASCEM Program for FY10.

References

1. U.S. DEPARTMENT OF ENERGY, Engineering and Technology Roadmap: Reducing the Uncertainty in the EM Program. U.S. Department of Energy (2008).
2. NATIONAL RESEARCH COUNCIL, Advice on the Department of Energy's Cleanup Technology Roadmap, Gaps and Bridges. The National Academy Press (2009).
3. U.S. DEPARTMENT OF ENERGY, Report of the Computational Subsurface Sciences Workshop, January 9 – 12, 2007. U.S. Department of Energy (2007).
4. E.M. PIERCE et al., "Scientific Opportunities to Reduce Risk in Groundwater and Soil Remediation", PNNL-18516. Pacific Northwest National Laboratory (2009).

APPENDIX A - FY10 Key Lab Personnel by Task

See separate attachment

APPENDIX B - Detailed FY10 ASCEM Master Schedule

See separate attachment

APPENDIX C – FY10 Total Lab Budgets (Detail at the Activity Level)

See separate attachment

APPENDIX D - FY10 WBS Budgets by Activity with Lab Participant

See separate attachment

Appendix A ASCEM Lab Personnel by Task 031810

WBS 1.1	ASCEM Project									
WBS 1.1.1	Platform and Key Toolsets Thrust Area	Ian Gorton (PNNL) THRUST LEAD	ANL Key personnal	INL Key personna	LANL Key personnal	LBNL Key personna	LLNL Key personnal	ORNL Key personnal	PNNL Key personnal	SRNL Key personnal
1.1.1.1	Platform Thrust Area Management	Ian Gorton (PNNL)				Stefan Finsterle			Ian Gorton	
1.1.1.2	Core Platform Development	Karen Schuchardt (PNNL)				Deb Agarwal, Cecilia Aragon, Matt Reagan	Tom Buscheck		Ian Gorton Chandrika Sivaramakrishnan Peter Hui	Carol Eddy-Dilek
1.1.1.3	Data Management	Deb Agarwal Arie Shoshani (LBNL)		Roelof Versteeg		Deb Agarwal Arie Shoshani Boris Faybishenko John Peterson Cecilia Aragon Alex Romosan	Tom Buscheck		Gary Black Signa Wurstner	
1.1.1.4	Model Development and Analysis	Carl Gable (LANL)			Carl Gable Elizabeth Keating Monty Vesselinov David Higdon James Ahrens Zhenxue Dai Dylan Harp	Stefan Finsterle Wes Bethel Janet Jacobson Jinsong Chen Mike Kowalsky Yingqi Zhang Dmitriy Silin	Tom Buscheck Yunwei Sun Charles Tong		Mark Williams Mark Rockhold	Phil Moore
1.1.1.5	Decision Support Toolset	Monty Vesselinov (LANL)			Monty Vesselinov Dylan Harp	Yingqi Zhang	Yunwei Sun Charles Tong			Karen Vangelas
1.1.1.6	Risk Analysis Toolset	Wilson McGinn (ORNL)	S.Y. Chen Charley Yu					Wilson McGinn		Tim Jannik
WBS 1.1.2	Process Models and HPC Framework Thrust Area	Dave Moulton (LANL) THRUST LEAD								
1.1.2.1	Process Thrust Area Management	Dave Moulton (LANL)			Dave Moulton	Carl Steefel				
1.1.2.2	Process Models	Carl Steefel (LBNL)		Hai Huang Glen Hansen	George Zyvoloski Peter Lichtner	Carl Steefel Karsten Pruess John Bell George Moridis Nic Spycher Eric Sonnenthal Jonny Rutqvist	Tom Wolery		Steve Yabusaki Diana Bacon Glenn Hammond	Greg Flach
1.1.2.3	HPC Core Framework	Lori Pritchett-Sheats (LANL)	Barry Smith	Hai Huang Glen Hansen	Dave Moulton Bryan Lally Mike Buksas Ben Bergen Robert Lowrie Lori Pritchett-Sheats	George Moridis Bill Isaacs		Bobby Philip David Bernholdt Richard Mills	Steve Yabusaki Mark White Bruce Palmer Lynn Trease Vicky Freedman Glenn Hammond	

Appendix A ASCEM Lab Personnel by Task 031810

[illegible]

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Total Cost	2010						2011
						Q4	Q1	Q2	Q3	Q4	Q1	
ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010		285	02-Nov-09	17-Dec-10	\$10,349,192.98							
ASCEM MasterBaseline.1.1 ASCEM Project		285	02-Nov-09	17-Dec-10	\$10,349,192.98							
ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area		285	02-Nov-09	17-Dec-10	\$3,355,174.00							
ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management		275	02-Nov-09	03-Dec-10	\$379,913.49							
A2835	Platform Thrust Area Planning and Implementation Planning	60	02-Nov-09	29-Jan-10	\$225,525.00							
A2840	Platform Thrust Area Management	215	01-Feb-10	03-Dec-10	\$98,990.76							
A2845	Integrated Implementation Plan & Charter for Platform Thrust	151	01-Mar-10	30-Sep-10	\$31,330.00							
A2880	Platform Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$24,067.73							
ASCEM MasterBaseline.1.1.1.2 Core Platform Development		225	01-Feb-10	17-Dec-10	\$670,895.02							
A2000	Solicit Core Platform User Requirements	53	01-Feb-10	14-Apr-10	\$89,271.10							
A2010	Document Core Platform User Requirements	22	15-Apr-10	14-May-10	\$58,080.90							
A2020	Core Platform User Requirements Document Complete	0		14-May-10	\$0.00							
A2030	Design Core Platform	42	17-May-10	15-Jul-10	\$130,311.72							
A2040	Core Platform Design Document Complete	0		15-Jul-10	\$0.00							
A2050	Implement Core Platform Initial Component Prototypes	64	16-Jul-10	14-Oct-10	\$193,723.30							
A2060	Create Core Platform Test Environment	64	16-Jul-10	14-Oct-10	\$62,176.00							
A2070	Implement Core Platform for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$137,332.00							
A2080	Core Platform for Phase I Demonstration Complete	0		17-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.1.3 Data Management		225	01-Feb-10	17-Dec-10	\$636,228.28							
A2090	Develop Documented Prioritized Set of Data Management Requirements	75	01-Feb-10	14-May-10	\$112,034.40							
A2100	Data and Information Management Requirements Document Complete	0		14-May-10	\$0.00							
A2110	Design Information System Schema, Provenance, & Metadata	87	15-Mar-10	15-Jul-10	\$116,725.40							
A2120	Data Management System Design Document Complete	0		15-Jul-10	\$0.00							
A2130	Identify & Prep Data Needed to Support Phase I Demonstrations	140	17-May-10	03-Dec-10	\$88,161.90							
A2140	Develop Information System Schema, Provenance, & Metadata	106	17-May-10	14-Oct-10	\$126,849.18							
A2150	Implement Model Data Access Capabilities to Support Phase I Demonstration	64	16-Jul-10	14-Oct-10	\$71,294.00							
A2160	Ingest Data Needed for Phase I Demonstration	85	16-Jul-10	12-Nov-10	\$32,000.00							
A2170	Phase I Demonstration Model Execution & Data Storage Mechanisms	44	15-Oct-10	17-Dec-10	\$89,163.40							
A2180	Phase I Demonstration Data Management System Complete	0		17-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis		225	01-Feb-10	17-Dec-10	\$1,305,835.21							
A2700	Define Requirements for Model Setup & Analysis	53	01-Feb-10	14-Apr-10	\$253,930.00							

■ Remaining Work ◆ ◆ Milestone
■ Critical Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Total Cost	2010						2011
						Q4	Q1	Q2	Q3	Q4	Q1	
A2710	Document Requirements	22	15-Apr-10	14-May-10	\$104,961.99							
A2720	Model Setup/Analysis Requirements Document Complete	0		14-May-10	\$0.00							
A2730	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$346,165.40							
A2740	Model Setup/Analysis Toolset Design Document Complete	0		15-Jul-10	\$0.00							
A2750	Implement Model Setup Toolset Prototype	64	16-Jul-10	14-Oct-10	\$59,882.61							
A2760	Implement Parameter Estimation Toolset Prototype	64	16-Jul-10	14-Oct-10	\$62,966.00							
A2770	Implement Uncertainty Quantification Toolset Prototype	64	16-Jul-10	14-Oct-10	\$114,884.61							
A2780	Implement Visualization Toolset Prototype	64	16-Jul-10	14-Oct-10	\$99,255.00							
A2790	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$263,789.60							
A2800	Model Setup/Analysis Toolset Demonstration Complete	0		17-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.1.5 Decision Support Toolset		215	01-Feb-10	03-Dec-10	\$129,802.00							
A2190	Define Requirements for Decision Support Toolset	65	01-Feb-10	30-Apr-10	\$35,530.00							
A2200	Decision Support Toolset Requirements Document Complete	0		30-Apr-10	\$0.00							
A2210	Design Decision Support Toolset	42	03-May-10	30-Jun-10	\$41,957.00							
A2220	Model Setup/Analysis Toolset Design Document Complete	0		30-Jun-10	\$0.00							
A2230	Implement Decision Support Toolset Prototype	64	01-Jul-10	30-Sep-10	\$27,109.00							
A2240	Implement Decision Support Toolset Demonstration for Phase I	44	01-Oct-10	03-Dec-10	\$25,206.00							
A2250	Decision Support Toolset Phase I Demonstration Complete	0		03-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset		215	01-Feb-10	03-Dec-10	\$232,500.00							
A2260	Define Risk Toolset Requirements	65	01-Feb-10	30-Apr-10	\$34,280.00							
A2270	Design Prototype of Risk Toolset	42	03-May-10	30-Jun-10	\$34,280.00							
A2280	Create Prototype of Risk Toolset Production Environment	64	01-Jul-10	30-Sep-10	\$114,601.00							
A2290	Phase I Demonstration of Risk Assessment Toolset Prototype	44	01-Oct-10	03-Dec-10	\$49,339.00							
A2300	Risk Toolset Prototype Phase I Demonstration Complete	0		03-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thr...		285	02-Nov-09	17-Dec-10	\$3,568,848.98							
ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management		275	02-Nov-09	03-Dec-10	\$478,261.98							
A2850	Process Models & HPC Framework Thrust Area Management	215	01-Feb-10	03-Dec-10	\$111,855.00							
A2855	Integrated Implementation Plan & Charter for HPC Thrust	151	01-Mar-10	30-Sep-10	\$36,300.00							
A2860	Process Models & HPC Framework Planning and Implementation Plan	60	02-Nov-09	29-Jan-10	\$309,257.98							
A2870	Process Models & HPC Framework FY11 Planning	66	29-Jun-10	30-Sep-10	\$20,849.00							
ASCEM MasterBaseline.1.1.2.2 Process Models		225	01-Feb-10	17-Dec-10	\$606,691.63							

Remaining Work
 Critical Remaining Work
 Milestone

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Total Cost	2010						2011
						Q4	Q1	Q2	Q3	Q4	Q1	
A2310	Collect & Organize Information on Established Process Models	75	01-Feb-10	14-May-10	\$154,600.23							
A2320	Solicit & Incorporate Preliminary Guidance on Site Attributes & Characteristics	75	01-Feb-10	14-May-10	\$70,127.40							
A2330	Complete Requirements Document for Process Models	0		14-May-10	\$0.00							
A2340	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$151,200.00							
A2350	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$141,081.00							
A2360	Complete Prioritization & Summary Report of Process Models	0		14-Oct-10	\$0.00							
A2370	Establish Conceptual Models with Site Data for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$89,683.00							
ASCEM MasterBaseline.1.1.2.3 HPC Core Framework		225	01-Feb-10	17-Dec-10	\$1,112,236.97							
A2380	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$174,811.50							
A2390	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$144,544.64							
A2400	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$184,104.65							
A2410	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$159,492.20							
A2420	Complete Requirements & Draft Design Document for HPC Core Framework	0		15-Jul-10	\$0.00							
A2430	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$449,283.98							
ASCEM MasterBaseline.1.1.2.4 HPC Toolsets		225	01-Feb-10	17-Dec-10	\$1,371,658.40							
A2450	Evaluate & Prototype Existing Toolsets & Algorithms	53	01-Feb-10	14-Apr-10	\$221,736.48							
A2460	Develop Draft of Requirements for HPC Toolsets	53	01-Feb-10	14-Apr-10	\$145,443.20							
A2465	Finalize Initial Requirements of HPC Toolsets	64	15-Apr-10	15-Jul-10	\$207,117.48							
A2470	Develop Draft Design for HPC Toolsets	64	15-Apr-10	15-Jul-10	\$141,777.40							
A2480	Complete Requirements & Draft Design Document for HPC Toolsets	0		15-Jul-10	\$0.00							
A2490	Develop Phase I Mesh Interfaces & Data Structures	108	16-Jul-10	17-Dec-10	\$109,449.36							
A2500	Implement Initial Solver Interfaces & Components	108	16-Jul-10	17-Dec-10	\$161,543.08							
A2510	Develop & Verify Phase 1 Prototype of Flow & Transport	64	16-Jul-10	14-Oct-10	\$165,072.80							
A2530	Develop & Verify Phase I Prototype of Geochemistry	64	16-Jul-10	14-Oct-10	\$97,384.60							
A2540	Perform Phase 1 Demonstration Simulations on Various Platforms	44	15-Oct-10	17-Dec-10	\$122,134.00							
A2550	Complete Phase I Prototype of Flow, Transport & Geochemistry Modules	0		14-Oct-10	\$0.00							
A2560	Complete Phase 1 Demonstration of Flow, Transport & Geochemistry Modules	0		17-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.3 Site Application Thrust Area		285	02-Nov-09	17-Dec-10	\$1,653,522.00							
ASCEM MasterBaseline.1.1.3.1 Site Application Thrust Area Management		275	02-Nov-09	03-Dec-10	\$209,561.36							
A2820	Site Application Thrust Area Planning & Implementation Plan	60	02-Nov-09	29-Jan-10	\$60,696.00							
A2830	Site Application Thrust Area Management	215	01-Feb-10	03-Dec-10	\$97,652.58							



Remaining Work ◆ ◆ Milestone
 Critical Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Total Cost	2010						2011
						Q4	Q1	Q2	Q3	Q4	Q1	
A2833	Integrated Implementation Plan & Charter for Site Application Thrust	151	01-Mar-10	30-Sep-10	\$33,670.00							
A2890	Site Application Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$17,542.78							
ASCEM MasterBaseline.1.1.3.2 User Requirements Interface		225	25-Jan-10	10-Dec-10	\$560,317.49							
A2570	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$109,139.44							
A2580	Review Plans & Specifications for Platform & HPC	65	01-Feb-10	30-Apr-10	\$101,118.10							
A2590	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$155,215.50							
A2595	Model Summary Report Document Complete	0		30-Jun-10	\$0.00							
A2600	Obtain User Feedback on ASCEM Activities	113	01-Jul-10	10-Dec-10	\$75,985.07							
A2610	Interface with PA CoP, LFRG & Other User Groups	225	25-Jan-10	10-Dec-10	\$118,859.38							
ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes		215	01-Feb-10	03-Dec-10	\$420,966.65							
A2620	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$207,298.30							
A2625	Draft Matrix of Potential Site Attributes Complete	0		14-May-10	\$0.00							
A2630	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$213,668.35							
A2810	Report of Site Attributes Complete	0		03-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites		175	12-Apr-10	17-Dec-10	\$462,676.50							
A2640	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$54,419.00							
A2650	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$84,524.80							
A2660	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$71,069.50							
A2670	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$167,070.00							
A2675	Demonstration Site(s) Data Set Complete	0		14-Oct-10	\$0.00							
A2690	Implement Phase I Data Set in Demonstration	44	15-Oct-10	17-Dec-10	\$85,593.20							
ASCEM MasterBaseline.1.1.4 ASCEM Management		285	02-Nov-09	17-Dec-10	\$1,771,648.00							
ASCEM MasterBaseline.1.1.4.1 Project Manager		285	02-Nov-09	17-Dec-10	\$1,033,075.98							
A10	Start Project	0	02-Nov-09		\$0.00							
A1060	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$494,255.50							
A1065	Integrated Implementation Plan & Charter for Project Mgmt	151	01-Mar-10	30-Sep-10	\$98,700.00							
A1100	Develop FY10 Implementation & Integrated Project Plan	60	02-Nov-09	29-Jan-10	\$377,826.00							
A1110	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$62,294.48							
A20	Finish Project	0		17-Dec-10	\$0.00							
ASCEM MasterBaseline.1.1.4.2 Technical Systems Integrator Lead		215	01-Feb-10	03-Dec-10	\$172,000.00							
A1070	Technical Systems Integration Lead Support	215	01-Feb-10	03-Dec-10	\$172,000.00							

Remaining Work
 Critical Remaining Work

◆ ◆ Milestone

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Total Cost	2010					2011
						Q4	Q1	Q2	Q3	Q4	Q1
ASCEM MasterBaseline.1.1.4.3 User Steering Committee Chair		215	01-Feb-10	03-Dec-10	\$64,200.00						
A1080	User Steering Committee Chair Support	215	01-Feb-10	03-Dec-10	\$64,200.00						
ASCEM MasterBaseline.1.1.4.4 Communication and Websites Lead		215	01-Feb-10	03-Dec-10	\$142,500.00						
A1090	Communication & Websites Lead Support	215	01-Feb-10	03-Dec-10	\$142,500.00						
ASCEM MasterBaseline.1.1.4.5 Project Controls and Business Management		252	07-Dec-09	03-Dec-10	\$184,872.00						
A1040	Develop FY10 Implementation & Integrated Project Plan	37	07-Dec-09	29-Jan-10	\$57,291.32						
A1045	Complete FY10 Implementation & Integrated Project Plan	0		29-Jan-10	\$0.00						
A1050	Project Controls and Business Management Support	215	01-Feb-10	03-Dec-10	\$127,580.68						
ASCEM MasterBaseline.1.1.4.6 Quality Assurance		275	02-Nov-09	03-Dec-10	\$175,000.02						
A0090	Quality Assurance Project Start-Up and Planning	40	02-Nov-09	31-Dec-09	\$8,378.64						
A1000	Develop QA Program Plan	30	04-Jan-10	12-Feb-10	\$12,412.80						
A1010	Review & Resolve Comments on QA Program Plan	10	15-Feb-10	26-Feb-10	\$4,654.80						
A1020	Attain Approval for QA Program Plan	20	01-Mar-10	26-Mar-10	\$775.80						
A1030	QA Support	220	25-Jan-10	03-Dec-10	\$148,777.98						

 Remaining Work ◆ ◆ Milestone
 Critical Remaining Work

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
ANL Resource		225	01-Feb-10	17-Dec-10	\$167,000.00
Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010		225	01-Feb-10	17-Dec-10	\$167,000.00
WBS: ASCEM MasterBaseline.1.1 ASCEM Project		225	01-Feb-10	17-Dec-10	\$167,000.00
WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area		215	01-Feb-10	03-Dec-10	\$90,000.00
WBS: ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset		215	01-Feb-10	03-Dec-10	\$90,000.00
	Define Risk Toolset Requirements	65	01-Feb-10	30-Apr-10	\$11,400.00
	Design Prototype of Risk Toolset	42	03-May-10	30-Jun-10	\$11,400.00
	Create Prototype of Risk Toolset Production Environment	64	01-Jul-10	30-Sep-10	\$52,060.00
	Phase I Demonstration of Risk Assessment Toolset Prototype	44	01-Oct-10	03-Dec-10	\$15,140.00
WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...		225	01-Feb-10	17-Dec-10	\$77,000.00
WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework		225	01-Feb-10	17-Dec-10	\$77,000.00
	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$28,400.00
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$8,400.00
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$8,400.00
	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$18,400.00
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$13,400.00
INL Resource		225	01-Feb-10	17-Dec-10	\$60,000.00
Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010		225	01-Feb-10	17-Dec-10	\$60,000.00
WBS: ASCEM MasterBaseline.1.1 ASCEM Project		225	01-Feb-10	17-Dec-10	\$60,000.00
WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area		44	01-Oct-10	03-Dec-10	\$20,000.00
WBS: ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset		44	01-Oct-10	03-Dec-10	\$20,000.00
	Phase I Demonstration of Risk Assessment Toolset Prototype	44	01-Oct-10	03-Dec-10	\$20,000.00
WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...		225	01-Feb-10	17-Dec-10	\$21,000.00
WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework		225	01-Feb-10	17-Dec-10	\$21,000.00
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$5,000.00
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$5,000.00
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$11,000.00
WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area		200	01-Mar-10	10-Dec-10	\$19,000.00
WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface		200	01-Mar-10	10-Dec-10	\$19,000.00
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$9,000.00
	Obtain User Feedback on ASCEM Activities	113	01-Jul-10	10-Dec-10	\$10,000.00
LANL Resource		285	02-Nov-09	17-Dec-10	\$3,073,150.00
Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010		285	02-Nov-09	17-Dec-10	\$3,073,150.00
WBS: ASCEM MasterBaseline.1.1 ASCEM Project		285	02-Nov-09	17-Dec-10	\$3,073,150.00
WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area		285	02-Nov-09	17-Dec-10	\$732,500.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	WBS: ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management	60	02-Nov-09	29-Jan-10	\$90,720.00
	Platform Thrust Area Planning and Implementation Planning	60	02-Nov-09	29-Jan-10	\$90,720.00
	WBS: ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis	225	01-Feb-10	17-Dec-10	\$571,978.00
	Define Requirements for Model Setup & Analysis	53	01-Feb-10	14-Apr-10	\$111,227.00
	Document Requirements	22	15-Apr-10	14-May-10	\$49,120.00
	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$151,800.00
	Implement Model Setup Toolset Prototype	64	16-Jul-10	14-Oct-10	\$31,843.00
	Implement Parameter Estimation Toolset Prototype	64	16-Jul-10	14-Oct-10	\$7,966.00
	Implement Uncertainty Quantification Toolset Prototype	64	16-Jul-10	14-Oct-10	\$86,845.00
	Implement Visualization Toolset Prototype	64	16-Jul-10	14-Oct-10	\$21,755.00
	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$111,422.00
	WBS: ASCEM MasterBaseline.1.1.1.5 Decision Support Toolset	215	01-Feb-10	03-Dec-10	\$69,802.00
	Define Requirements for Decision Support Toolset	65	01-Feb-10	30-Apr-10	\$15,530.00
	Design Decision Support Toolset	42	03-May-10	30-Jun-10	\$26,957.00
	Implement Decision Support Toolset Prototype	64	01-Jul-10	30-Sep-10	\$17,109.00
	Implement Decision Support Toolset Demonstration for Phase I	44	01-Oct-10	03-Dec-10	\$10,206.00
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	285	02-Nov-09	17-Dec-10	\$1,439,300.00
	WBS: ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management	275	02-Nov-09	03-Dec-10	\$367,811.00
	Process Models & HPC Framework Thrust Area Management	215	01-Feb-10	03-Dec-10	\$86,855.00
	Integrated Implementation Plan & Charter for HPC Thrust	151	01-Mar-10	30-Sep-10	\$36,300.00
	Process Models & HPC Framework Planning and Implementation Plan	60	02-Nov-09	29-Jan-10	\$233,807.00
	Process Models & HPC Framework FY11 Planning	66	29-Jun-10	30-Sep-10	\$10,849.00
	WBS: ASCEM MasterBaseline.1.1.2.2 Process Models	225	01-Feb-10	17-Dec-10	\$87,565.00
	Collect & Organize Information on Established Process Models	75	01-Feb-10	14-May-10	\$31,125.00
	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$22,438.00
	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$17,319.00
	Establish Conceptual Models with Site Data for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$16,683.00
	WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework	225	01-Feb-10	17-Dec-10	\$426,046.00
	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$64,518.00
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$57,836.00
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$62,965.00
	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$65,519.00
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$175,208.00
	WBS: ASCEM MasterBaseline.1.1.2.4 HPC Toolsets	225	01-Feb-10	17-Dec-10	\$557,878.00
	Evaluate & Prototype Existing Toolsets & Algorithms	53	01-Feb-10	14-Apr-10	\$73,668.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Develop Draft of Requirements for HPC Toolsets	53	01-Feb-10	14-Apr-10	\$62,505.00
	Finalize Initial Requirements of HPC Toolsets	64	15-Apr-10	15-Jul-10	\$73,449.00
	Develop Draft Design for HPC Toolsets	64	15-Apr-10	15-Jul-10	\$62,701.00
	Develop Phase I Mesh Interfaces & Data Structures	108	16-Jul-10	17-Dec-10	\$42,252.00
	Implement Initial Solver Interfaces & Components	108	16-Jul-10	17-Dec-10	\$81,396.00
	Develop & Verify Phase 1 Prototype of Flow & Transport	64	16-Jul-10	14-Oct-10	\$75,440.00
	Develop & Verify Phase I Prototype of Geochemistry	64	16-Jul-10	14-Oct-10	\$19,933.00
	Perform Phase 1 Demonstration Simulations on Various Platforms	44	15-Oct-10	17-Dec-10	\$66,534.00
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	285	02-Nov-09	17-Dec-10	\$132,500.00
	WBS: ASCEM MasterBaseline.1.1.3.1 Site Application Thrust Area Management	60	02-Nov-09	29-Jan-10	\$661.00
	Site Application Thrust Area Planning & Implementation Plan	60	02-Nov-09	29-Jan-10	\$661.00
	WBS: ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes	215	01-Feb-10	03-Dec-10	\$58,596.00
	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$33,484.00
	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$25,112.00
	WBS: ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites	175	12-Apr-10	17-Dec-10	\$73,243.00
	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$13,393.00
	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$8,371.00
	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$9,626.00
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$11,719.00
	Implement Phase I Data Set in Demonstration	44	15-Oct-10	17-Dec-10	\$30,134.00
	WBS: ASCEM MasterBaseline.1.1.4 ASCEM Management	275	02-Nov-09	03-Dec-10	\$768,850.00
	WBS: ASCEM MasterBaseline.1.1.4.1 Project Manager	275	02-Nov-09	03-Dec-10	\$658,978.00
	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$354,856.32
	Integrated Implementation Plan & Charter for Project Mgmt	151	01-Mar-10	30-Sep-10	\$51,850.00
	Develop FY10 Implementation & Integrated Project Plan	60	02-Nov-09	29-Jan-10	\$215,688.00
	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$36,583.68
	WBS: ASCEM MasterBaseline.1.1.4.5 Project Controls and Business Management	252	07-Dec-09	03-Dec-10	\$109,872.00
	Develop FY10 Implementation & Integrated Project Plan	37	07-Dec-09	29-Jan-10	\$44,077.00
	Project Controls and Business Management Support	215	01-Feb-10	03-Dec-10	\$65,795.00
	LSNL Resource	285	02-Nov-09	17-Dec-10	\$2,823,850.00
	Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010	285	02-Nov-09	17-Dec-10	\$2,823,850.00
	WBS: ASCEM MasterBaseline.1.1 ASCEM Project	285	02-Nov-09	17-Dec-10	\$2,823,850.00
	WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area	285	02-Nov-09	17-Dec-10	\$1,119,200.00
	WBS: ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management	275	02-Nov-09	03-Dec-10	\$87,200.00
	Platform Thrust Area Planning and Implementation Planning	60	02-Nov-09	29-Jan-10	\$52,200.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Platform Thrust Area Management	215	01-Feb-10	03-Dec-10	\$24,340.91
	Platform Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$10,659.09
	WBS: ASCEM MasterBaseline.1.1.1.2 Core Platform Development	225	01-Feb-10	17-Dec-10	\$159,000.00
	Solicit Core Platform User Requirements	53	01-Feb-10	14-Apr-10	\$40,000.00
	Document Core Platform User Requirements	22	15-Apr-10	14-May-10	\$13,000.00
	Design Core Platform	42	17-May-10	15-Jul-10	\$26,000.00
	Implement Core Platform Initial Component Prototypes	64	16-Jul-10	14-Oct-10	\$20,000.00
	Create Core Platform Test Environment	64	16-Jul-10	14-Oct-10	\$20,000.00
	Implement Core Platform for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$40,000.00
	WBS: ASCEM MasterBaseline.1.1.1.3 Data Management	225	01-Feb-10	17-Dec-10	\$478,000.00
	Develop Documented Prioritized Set of Data Management Requirements	75	01-Feb-10	14-May-10	\$85,000.00
	Design Information System Schema, Provenance, & Metadata	87	15-Mar-10	15-Jul-10	\$82,000.00
	Identify & Prep Data Needed to Support Phase I Demonstrations	140	17-May-10	03-Dec-10	\$70,000.00
	Develop Information System Schema, Provenance, & Metadata	106	17-May-10	14-Oct-10	\$95,000.00
	Implement Model Data Access Capabilities to Support Phase I Demonstration	64	16-Jul-10	14-Oct-10	\$50,000.00
	Ingest Data Needed for Phase I Demonstration	85	16-Jul-10	12-Nov-10	\$32,000.00
	Phase I Demonstration Model Execution & Data Storage Mechanisms	44	15-Oct-10	17-Dec-10	\$64,000.00
	WBS: ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis	225	01-Feb-10	17-Dec-10	\$370,000.00
	Define Requirements for Model Setup & Analysis	53	01-Feb-10	14-Apr-10	\$75,000.00
	Document Requirements	22	15-Apr-10	14-May-10	\$30,000.00
	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$100,000.00
	Implement Parameter Estimation Toolset Prototype	64	16-Jul-10	14-Oct-10	\$55,000.00
	Implement Visualization Toolset Prototype	64	16-Jul-10	14-Oct-10	\$55,000.00
	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$55,000.00
	WBS: ASCEM MasterBaseline.1.1.1.5 Decision Support Toolset	215	01-Feb-10	03-Dec-10	\$25,000.00
	Define Requirements for Decision Support Toolset	65	01-Feb-10	30-Apr-10	\$10,000.00
	Design Decision Support Toolset	42	03-May-10	30-Jun-10	\$5,000.00
	Implement Decision Support Toolset Prototype	64	01-Jul-10	30-Sep-10	\$5,000.00
	Implement Decision Support Toolset Demonstration for Phase I	44	01-Oct-10	03-Dec-10	\$5,000.00
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	285	02-Nov-09	17-Dec-10	\$899,000.00
	WBS: ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management	275	02-Nov-09	03-Dec-10	\$70,900.00
	Process Models & HPC Framework Thrust Area Management	215	01-Feb-10	03-Dec-10	\$25,000.00
	Process Models & HPC Framework Planning and Implementation Plan	60	02-Nov-09	29-Jan-10	\$35,900.00
	Process Models & HPC Framework FY11 Planning	66	29-Jun-10	30-Sep-10	\$10,000.00
	WBS: ASCEM MasterBaseline.1.1.2.2 Process Models	225	01-Feb-10	17-Dec-10	\$284,200.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Collect & Organize Information on Established Process Models	75	01-Feb-10	14-May-10	\$63,000.00
	Solicit & Incorporate Preliminary Guidance on Site Attributes & Characteristics	75	01-Feb-10	14-May-10	\$32,200.00
	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$63,000.00
	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$63,000.00
	Establish Conceptual Models with Site Data for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$63,000.00
	WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework	225	01-Feb-10	17-Dec-10	\$88,700.00
	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$12,000.00
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$11,500.00
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$10,500.00
	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$13,500.00
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$41,200.00
	WBS: ASCEM MasterBaseline.1.1.2.4 HPC Toolsets	225	01-Feb-10	17-Dec-10	\$455,200.00
	Evaluate & Prototype Existing Toolsets & Algorithms	53	01-Feb-10	14-Apr-10	\$66,000.00
	Develop Draft of Requirements for HPC Toolsets	53	01-Feb-10	14-Apr-10	\$56,400.00
	Finalize Initial Requirements of HPC Toolsets	64	15-Apr-10	15-Jul-10	\$62,600.00
	Develop Draft Design for HPC Toolsets	64	15-Apr-10	15-Jul-10	\$60,000.00
	Develop Phase I Mesh Interfaces & Data Structures	108	16-Jul-10	17-Dec-10	\$23,000.00
	Implement Initial Solver Interfaces & Components	108	16-Jul-10	17-Dec-10	\$52,000.00
	Develop & Verify Phase 1 Prototype of Flow & Transport	64	16-Jul-10	14-Oct-10	\$60,600.00
	Develop & Verify Phase I Prototype of Geochemistry	64	16-Jul-10	14-Oct-10	\$19,000.00
	Perform Phase 1 Demonstration Simulations on Various Platforms	44	15-Oct-10	17-Dec-10	\$55,600.00
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	280	02-Nov-09	10-Dec-10	\$296,052.00
	WBS: ASCEM MasterBaseline.1.1.3.1 Site Application Thrust Area Management	275	02-Nov-09	03-Dec-10	\$47,385.00
	Site Application Thrust Area Planning & Implementation Plan	60	02-Nov-09	29-Jan-10	\$12,413.00
	Site Application Thrust Area Management	215	01-Feb-10	03-Dec-10	\$29,646.72
	Site Application Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$5,325.28
	WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface	225	25-Jan-10	10-Dec-10	\$107,514.00
	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$32,522.00
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$37,496.00
	Interface with PA CoP, LFRG & Other User Groups	225	25-Jan-10	10-Dec-10	\$37,496.00
	WBS: ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes	215	01-Feb-10	03-Dec-10	\$64,437.00
	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$21,917.00
	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$42,520.00
	WBS: ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites	131	12-Apr-10	14-Oct-10	\$76,716.00
	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$3,380.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$30,951.00
	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$12,440.00
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$29,945.00
	WBS: ASCEM MasterBaseline.1.1.4 ASCEM Management	275	02-Nov-09	03-Dec-10	\$509,598.00
	WBS: ASCEM MasterBaseline.1.1.4.1 Project Manager	275	02-Nov-09	03-Dec-10	\$195,098.00
	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$26,670.45
	Integrated Implementation Plan & Charter for Project Mgmt	151	01-Mar-10	30-Sep-10	\$46,850.00
	Develop FY10 Implementation & Integrated Project Plan	60	02-Nov-09	29-Jan-10	\$116,248.00
	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$5,329.55
	WBS: ASCEM MasterBaseline.1.1.4.2 Technical Systems Integrator Lead	215	01-Feb-10	03-Dec-10	\$172,000.00
	Technical Systems Integration Lead Support	215	01-Feb-10	03-Dec-10	\$172,000.00
	WBS: ASCEM MasterBaseline.1.1.4.4 Communication and Websites Lead	215	01-Feb-10	03-Dec-10	\$142,500.00
	Communication & Websites Lead Support	215	01-Feb-10	03-Dec-10	\$142,500.00
	LLNL Resource	285	02-Nov-09	17-Dec-10	\$465,192.98
	Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010	285	02-Nov-09	17-Dec-10	\$465,192.98
	WBS: ASCEM MasterBaseline.1.1 ASCEM Project	285	02-Nov-09	17-Dec-10	\$465,192.98
	WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area	285	02-Nov-09	17-Dec-10	\$170,144.00
	WBS: ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management	60	02-Nov-09	29-Jan-10	\$37,644.00
	Platform Thrust Area Planning and Implementation Planning	60	02-Nov-09	29-Jan-10	\$37,644.00
	WBS: ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis	225	01-Feb-10	17-Dec-10	\$132,500.00
	Define Requirements for Model Setup & Analysis	53	01-Feb-10	14-Apr-10	\$50,000.00
	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$40,000.00
	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$42,500.00
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	285	02-Nov-09	17-Dec-10	\$217,548.98
	WBS: ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management	60	02-Nov-09	29-Jan-10	\$17,548.98
	Process Models & HPC Framework Planning and Implementation Plan	60	02-Nov-09	29-Jan-10	\$17,548.98
	WBS: ASCEM MasterBaseline.1.1.2.2 Process Models	181	01-Feb-10	14-Oct-10	\$75,000.00
	Collect & Organize Information on Established Process Models	75	01-Feb-10	14-May-10	\$40,000.00
	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$17,500.00
	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$17,500.00
	WBS: ASCEM MasterBaseline.1.1.2.4 HPC Toolsets	225	01-Feb-10	17-Dec-10	\$125,000.00
	Evaluate & Prototype Existing Toolsets & Algorithms	53	01-Feb-10	14-Apr-10	\$40,000.00
	Develop Draft of Requirements for HPC Toolsets	53	01-Feb-10	14-Apr-10	\$25,000.00
	Finalize Initial Requirements of HPC Toolsets	64	15-Apr-10	15-Jul-10	\$29,000.00
	Develop Draft Design for HPC Toolsets	64	15-Apr-10	15-Jul-10	\$16,000.00

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Implement Initial Solver Interfaces & Components	108	16-Jul-10	17-Dec-10	\$15,000.00
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	107	01-Feb-10	30-Jun-10	\$77,500.00
	WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface	107	01-Feb-10	30-Jun-10	\$77,500.00
	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$20,000.00
	Review Plans & Specifications for Platform & HPC	65	01-Feb-10	30-Apr-10	\$37,500.00
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$20,000.00
	ORNL Resource	225	01-Feb-10	17-Dec-10	\$720,000.00
	Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010	225	01-Feb-10	17-Dec-10	\$720,000.00
	WBS: ASCEM MasterBaseline.1.1 ASCEM Project	225	01-Feb-10	17-Dec-10	\$720,000.00
	WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area	215	01-Feb-10	03-Dec-10	\$105,000.00
	WBS: ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset	215	01-Feb-10	03-Dec-10	\$105,000.00
	Define Risk Toolset Requirements	65	01-Feb-10	30-Apr-10	\$17,700.00
	Design Prototype of Risk Toolset	42	03-May-10	30-Jun-10	\$17,700.00
	Create Prototype of Risk Toolset Production Environment	64	01-Jul-10	30-Sep-10	\$55,401.00
	Phase I Demonstration of Risk Assessment Toolset Prototype	44	01-Oct-10	03-Dec-10	\$14,199.00
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	225	01-Feb-10	17-Dec-10	\$245,000.00
	WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework	225	01-Feb-10	17-Dec-10	\$245,000.00
	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$34,500.00
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$32,000.00
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$30,000.00
	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$36,500.00
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$112,000.00
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	225	01-Feb-10	17-Dec-10	\$335,000.00
	WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface	220	01-Feb-10	10-Dec-10	\$87,500.00
	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$20,000.00
	Review Plans & Specifications for Platform & HPC	65	01-Feb-10	30-Apr-10	\$20,000.00
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$27,500.00
	Obtain User Feedback on ASCEM Activities	113	01-Jul-10	10-Dec-10	\$20,000.00
	WBS: ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes	215	01-Feb-10	03-Dec-10	\$160,000.00
	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$90,000.00
	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$70,000.00
	WBS: ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites	175	12-Apr-10	17-Dec-10	\$87,500.00
	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$10,000.00
	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$15,000.00
	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$15,000.00















































Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$27,500.00
	Implement Phase I Data Set in Demonstration	44	15-Oct-10	17-Dec-10	\$20,000.00
	WBS: ASCEM MasterBaseline.1.1.4 ASCEM Management	215	01-Feb-10	03-Dec-10	\$35,000.00
	WBS: ASCEM MasterBaseline.1.1.4.1 Project Manager	215	01-Feb-10	03-Dec-10	\$35,000.00
	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$29,670.45
	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$5,329.55
	PNNL Resource	285	02-Nov-09	17-Dec-10	\$2,375,000.00
	Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010	285	02-Nov-09	17-Dec-10	\$2,375,000.00
	WBS: ASCEM MasterBaseline.1.1 ASCEM Project	285	02-Nov-09	17-Dec-10	\$2,375,000.00
	WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area	285	02-Nov-09	17-Dec-10	\$943,330.00
	WBS: ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management	275	02-Nov-09	03-Dec-10	\$164,349.49
	Platform Thrust Area Planning and Implementation Planning	60	02-Nov-09	29-Jan-10	\$44,961.00
	Platform Thrust Area Management	215	01-Feb-10	03-Dec-10	\$74,649.85
	Integrated Implementation Plan & Charter for Platform Thrust	151	01-Mar-10	30-Sep-10	\$31,330.00
	Platform Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$13,408.64
	WBS: ASCEM MasterBaseline.1.1.1.2 Core Platform Development	225	01-Feb-10	17-Dec-10	\$476,895.02
	Solicit Core Platform User Requirements	53	01-Feb-10	14-Apr-10	\$44,271.10
	Document Core Platform User Requirements	22	15-Apr-10	14-May-10	\$40,080.90
	Design Core Platform	42	17-May-10	15-Jul-10	\$99,311.72
	Implement Core Platform Initial Component Prototypes	64	16-Jul-10	14-Oct-10	\$163,723.30
	Create Core Platform Test Environment	64	16-Jul-10	14-Oct-10	\$42,176.00
	Implement Core Platform for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$87,332.00
	WBS: ASCEM MasterBaseline.1.1.1.3 Data Management	225	01-Feb-10	17-Dec-10	\$158,228.28
	Develop Documented Prioritized Set of Data Management Requirements	75	01-Feb-10	14-May-10	\$27,034.40
	Design Information System Schema, Provenance, & Metadata	87	15-Mar-10	15-Jul-10	\$34,725.40
	Identify & Prep Data Needed to Support Phase I Demonstrations	140	17-May-10	03-Dec-10	\$18,161.90
	Develop Information System Schema, Provenance, & Metadata	106	17-May-10	14-Oct-10	\$31,849.18
	Implement Model Data Access Capabilities to Support Phase I Demonstration	64	16-Jul-10	14-Oct-10	\$21,294.00
	Phase I Demonstration Model Execution & Data Storage Mechanisms	44	15-Oct-10	17-Dec-10	\$25,163.40
	WBS: ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis	225	01-Feb-10	17-Dec-10	\$143,857.21
	Define Requirements for Model Setup & Analysis	53	01-Feb-10	14-Apr-10	\$17,703.00
	Document Requirements	22	15-Apr-10	14-May-10	\$5,841.99
	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$31,865.40
	Implement Model Setup Toolset Prototype	64	16-Jul-10	14-Oct-10	\$28,039.61
	Implement Uncertainty Quantification Toolset Prototype	64	16-Jul-10	14-Oct-10	\$28,039.61


Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$32,367.60
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	285	02-Nov-09	17-Dec-10	\$635,000.00
	WBS: ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management	60	02-Nov-09	29-Jan-10	\$22,002.00
	Process Models & HPC Framework Planning and Implementation Plan	60	02-Nov-09	29-Jan-10	\$22,002.00
	WBS: ASCEM MasterBaseline.1.1.2.2 Process Models	181	01-Feb-10	14-Oct-10	\$124,926.63
	Collect & Organize Information on Established Process Models	75	01-Feb-10	14-May-10	\$20,475.23
	Solicit & Incorporate Preliminary Guidance on Site Attributes & Characteristics	75	01-Feb-10	14-May-10	\$27,927.40
	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$38,262.00
	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$38,262.00
	WBS: ASCEM MasterBaseline.1.1.2.3 HPC Core Framework	225	01-Feb-10	17-Dec-10	\$254,490.97
	Evaluate & Prototype Existing Frameworks	53	01-Feb-10	14-Apr-10	\$35,393.50
	Develop Draft of Requirements for HPC Core Framework	53	01-Feb-10	14-Apr-10	\$29,808.64
	Finalize Initial Requirements of HPC Core Framework	64	15-Apr-10	15-Jul-10	\$67,239.65
	Develop Draft Design for HPC Core Framework	64	15-Apr-10	15-Jul-10	\$25,573.20
	Initial Prototype of HPC Core Framework Services/Data Structures	108	16-Jul-10	17-Dec-10	\$96,475.98
	WBS: ASCEM MasterBaseline.1.1.2.4 HPC Toolsets	225	01-Feb-10	17-Dec-10	\$233,580.40
	Evaluate & Prototype Existing Toolsets & Algorithms	53	01-Feb-10	14-Apr-10	\$42,068.48
	Develop Draft of Requirements for HPC Toolsets	53	01-Feb-10	14-Apr-10	\$1,538.20
	Finalize Initial Requirements of HPC Toolsets	64	15-Apr-10	15-Jul-10	\$42,068.48
	Develop Draft Design for HPC Toolsets	64	15-Apr-10	15-Jul-10	\$3,076.40
	Develop Phase I Mesh Interfaces & Data Structures	108	16-Jul-10	17-Dec-10	\$44,197.36
	Implement Initial Solver Interfaces & Components	108	16-Jul-10	17-Dec-10	\$13,147.08
	Develop & Verify Phase 1 Prototype of Flow & Transport	64	16-Jul-10	14-Oct-10	\$29,032.80
	Develop & Verify Phase I Prototype of Geochemistry	64	16-Jul-10	14-Oct-10	\$58,451.60
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	285	02-Nov-09	17-Dec-10	\$460,970.00
	WBS: ASCEM MasterBaseline.1.1.3.1 Site Applicaton Thrust Area Management	275	02-Nov-09	03-Dec-10	\$161,515.36
	Site Application Thrust Area Planning & Implementation Plan	60	02-Nov-09	29-Jan-10	\$47,622.00
	Site Application Thrust Area Management	215	01-Feb-10	03-Dec-10	\$68,005.86
	Integrated Implementation Plan & Charter for Site Application Thrust	151	01-Mar-10	30-Sep-10	\$33,670.00
	Site Application Thrust FY11 Planning	66	29-Jun-10	30-Sep-10	\$12,217.50
	WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface	225	25-Jan-10	10-Dec-10	\$93,803.49
	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$11,617.44
	Review Plans & Specifications for Platform & HPC	65	01-Feb-10	30-Apr-10	\$23,618.10
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$31,219.50
	Obtain User Feedback on ASCEM Activities	113	01-Jul-10	10-Dec-10	\$15,985.07

Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Interface with PA CoP, LFRG & Other User Groups	225	25-Jan-10	10-Dec-10	\$11,363.38
	WBS: ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes	215	01-Feb-10	03-Dec-10	\$67,933.65
	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$41,897.30
	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$26,036.35
	WBS: ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites	175	12-Apr-10	17-Dec-10	\$137,717.50
	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$17,646.00
	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$15,202.80
	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$19,003.50
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$30,406.00
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$40,000.00
	Implement Phase I Data Set in Demonstration	44	15-Oct-10	17-Dec-10	\$15,459.20
	WBS: ASCEM MasterBaseline.1.1.4 ASCEM Management	275	02-Nov-09	03-Dec-10	\$335,700.00
	WBS: ASCEM MasterBaseline.1.1.4.1 Project Manager	275	02-Nov-09	03-Dec-10	\$85,699.98
	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$59,888.28
	Develop FY10 Implementation & Integrated Project Plan	60	02-Nov-09	29-Jan-10	\$16,090.00
	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$9,721.70
	WBS: ASCEM MasterBaseline.1.1.4.5 Project Controls and Business Management	252	07-Dec-09	03-Dec-10	\$75,000.00
	Develop FY10 Implementation & Integrated Project Plan	37	07-Dec-09	29-Jan-10	\$13,214.32
	Project Controls and Business Management Support	215	01-Feb-10	03-Dec-10	\$61,785.68
	WBS: ASCEM MasterBaseline.1.1.4.6 Quality Assurance	275	02-Nov-09	03-Dec-10	\$175,000.02
	Quality Assurance Project Start-Up and Planning	40	02-Nov-09	31-Dec-09	\$8,378.64
	Develop QA Program Plan	30	04-Jan-10	12-Feb-10	\$12,412.80
	Review & Resolve Comments on QA Program Plan	10	15-Feb-10	26-Feb-10	\$4,654.80
	Attain Approval for QA Program Plan	20	01-Mar-10	26-Mar-10	\$775.80
	QA Support	220	25-Jan-10	03-Dec-10	\$148,777.98
	SRNL Resource	285	02-Nov-09	17-Dec-10	\$665,000.00
	Project: ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010	285	02-Nov-09	17-Dec-10	\$665,000.00
	WBS: ASCEM MasterBaseline.1.1 ASCEM Project	285	02-Nov-09	17-Dec-10	\$665,000.00
	WBS: ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area	225	01-Feb-10	17-Dec-10	\$175,000.00
	WBS: ASCEM MasterBaseline.1.1.1.2 Core Platform Development	225	01-Feb-10	17-Dec-10	\$35,000.00
	Solicit Core Platform User Requirements	53	01-Feb-10	14-Apr-10	\$5,000.00
	Document Core Platform User Requirements	22	15-Apr-10	14-May-10	\$5,000.00
	Design Core Platform	42	17-May-10	15-Jul-10	\$5,000.00
	Implement Core Platform Initial Component Prototypes	64	16-Jul-10	14-Oct-10	\$10,000.00
	Implement Core Platform for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$10,000.00





















































Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	WBS: ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis	172	15-Apr-10	17-Dec-10	\$87,500.00
	Document Requirements	22	15-Apr-10	14-May-10	\$20,000.00
	Design Model Setup/Analysis Toolset	42	17-May-10	15-Jul-10	\$22,500.00
	Implement Visualization Toolset Prototype	64	16-Jul-10	14-Oct-10	\$22,500.00
	Implement Model Setup/Analysis Toolset Demonstration	44	15-Oct-10	17-Dec-10	\$22,500.00
	WBS: ASCEM MasterBaseline.1.1.1.5 Decision Support Toolset	215	01-Feb-10	03-Dec-10	\$35,000.00
	Define Requirements for Decision Support Toolset	65	01-Feb-10	30-Apr-10	\$10,000.00
	Design Decision Support Toolset	42	03-May-10	30-Jun-10	\$10,000.00
	Implement Decision Support Toolset Prototype	64	01-Jul-10	30-Sep-10	\$5,000.00
	Implement Decision Support Toolset Demonstration for Phase I	44	01-Oct-10	03-Dec-10	\$10,000.00
	WBS: ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset	171	01-Feb-10	30-Sep-10	\$17,500.00
	Define Risk Toolset Requirements	65	01-Feb-10	30-Apr-10	\$5,180.00
	Design Prototype of Risk Toolset	42	03-May-10	30-Jun-10	\$5,180.00
	Create Prototype of Risk Toolset Production Environment	64	01-Jul-10	30-Sep-10	\$7,140.00
	WBS: ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust A...	225	01-Feb-10	17-Dec-10	\$35,000.00
	WBS: ASCEM MasterBaseline.1.1.2.2 Process Models	225	01-Feb-10	17-Dec-10	\$35,000.00
	Solicit & Incorporate Preliminary Guidance on Site Attributes & Characteristics	75	01-Feb-10	14-May-10	\$10,000.00
	Analyze & Summarize Impact of Site Attributes on Process Models	106	17-May-10	14-Oct-10	\$10,000.00
	Develop a Prioritization of Process Models for the HPC Simulator	106	17-May-10	14-Oct-10	\$5,000.00
	Establish Conceptual Models with Site Data for Phase I Demonstration	44	15-Oct-10	17-Dec-10	\$10,000.00
	WBS: ASCEM MasterBaseline.1.1.3 Site Application Thrust Area	230	25-Jan-10	17-Dec-10	\$332,500.00
	WBS: ASCEM MasterBaseline.1.1.3.2 User Requirements Interface	225	25-Jan-10	10-Dec-10	\$175,000.00
	Collect User Input for ASCEM Requirements	65	01-Feb-10	30-Apr-10	\$25,000.00
	Review Plans & Specifications for Platform & HPC	65	01-Feb-10	30-Apr-10	\$20,000.00
	Collect User Input & Revise Model Review Document	87	01-Mar-10	30-Jun-10	\$30,000.00
	Obtain User Feedback on ASCEM Activities	113	01-Jul-10	10-Dec-10	\$30,000.00
	Interface with PA CoP, LFRG & Other User Groups	225	25-Jan-10	10-Dec-10	\$70,000.00
	WBS: ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes	215	01-Feb-10	03-Dec-10	\$70,000.00
	Establish Draft Matrix of Potential Site Attributes	75	01-Feb-10	14-May-10	\$20,000.00
	Finalize Matrix of Attributes & Produce Final Report	140	17-May-10	03-Dec-10	\$50,000.00
	WBS: ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites	175	12-Apr-10	17-Dec-10	\$87,500.00
	Develop Candidate Demonstration Short List	25	12-Apr-10	14-May-10	\$10,000.00
	Document Candidate Demonstration Short List	87	17-May-10	17-Sep-10	\$15,000.00
	Select Phase I Data Set and Document	19	17-May-10	11-Jun-10	\$15,000.00
	Prepare Phase I Data Set for Demonstration	87	14-Jun-10	14-Oct-10	\$27,500.00





















































Activity ID	Activity Name	Original Duration	Start	Finish	Budgeted Cost
	Implement Phase I Data Set in Demonstration	44	15-Oct-10	17-Dec-10	\$20,000.00
	WBS: ASCEM MasterBaseline.1.1.4 ASCEM Management	275	02-Nov-09	03-Dec-10	\$122,500.00
	WBS: ASCEM MasterBaseline.1.1.4.1 Project Manager	275	02-Nov-09	03-Dec-10	\$58,300.00
	Project Manager and Lab Lead Support	215	01-Feb-10	03-Dec-10	\$23,170.00
	Develop FY10 Implementation & Integrated Project Plan	60	02-Nov-09	29-Jan-10	\$29,800.00
	Coordinate and Develop FY11 Plan	66	29-Jun-10	30-Sep-10	\$5,330.00
	WBS: ASCEM MasterBaseline.1.1.4.3 User Steering Committee Chair	215	01-Feb-10	03-Dec-10	\$64,200.00
	User Steering Committee Chair Support	215	01-Feb-10	03-Dec-10	\$64,200.00





















































Resource ID	Activity Start	Activity Finish	Budgeted Cost
 ASCEM MasterBaseline ASCEM Master Baseline Project - Feb 2010			\$10,349,192.98
 ASCEM MasterBaseline.1.1 ASCEM Project			\$10,349,192.98
 ASCEM MasterBaseline.1.1.1 Platform and Key Toolsets Thrust Area			\$3,355,174.00
 ASCEM MasterBaseline.1.1.1.1 Platform Thrust Area Management			\$379,913.49
 A2840 Platform Thrust Area Management			\$98,990.76
 LBNL Resource	01-Feb-10	03-Dec-10	\$24,340.91
 PNNL Resource	01-Feb-10	03-Dec-10	\$74,649.85
 A2835 Platform Thrust Area Planning and Implementation Planning			\$225,525.00
 LANL Resource	02-Nov-09	29-Jan-10	\$90,720.00
 LBNL Resource	02-Nov-09	29-Jan-10	\$52,200.00
 LLNL Resource	02-Nov-09	29-Jan-10	\$37,644.00
 PNNL Resource	02-Nov-09	29-Jan-10	\$44,961.00
 A2880 Platform Thrust FY11 Planning			\$24,067.73
 LBNL Resource	29-Jun-10	30-Sep-10	\$10,659.09
 PNNL Resource	29-Jun-10	30-Sep-10	\$13,408.64
 A2845 Integrated Implementation Plan & Charter for Platform Thrust			\$31,330.00
 PNNL Resource	01-Mar-10	30-Sep-10	\$31,330.00
 ASCEM MasterBaseline.1.1.1.2 Core Platform Development			\$670,895.02
 A2000 Solicit Core Platform User Requirements			\$89,271.10
 LBNL Resource	01-Feb-10	14-Apr-10	\$40,000.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$44,271.10
 SRNL Resource	01-Feb-10	14-Apr-10	\$5,000.00
 A2010 Document Core Platform User Requirements			\$58,080.90
 LBNL Resource	15-Apr-10	14-May-10	\$13,000.00
 PNNL Resource	15-Apr-10	14-May-10	\$40,080.90
 SRNL Resource	15-Apr-10	14-May-10	\$5,000.00
 A2030 Design Core Platform			\$130,311.72
 LBNL Resource	17-May-10	15-Jul-10	\$26,000.00
 PNNL Resource	17-May-10	15-Jul-10	\$99,311.72
 SRNL Resource	17-May-10	15-Jul-10	\$5,000.00
 A2050 Implement Core Platform Initial Component Prototypes			\$193,723.30
 LBNL Resource	16-Jul-10	14-Oct-10	\$20,000.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$163,723.30
 SRNL Resource	16-Jul-10	14-Oct-10	\$10,000.00
 A2060 Create Core Platform Test Environment			\$62,176.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$20,000.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$42,176.00
 A2070 Implement Core Platform for Phase I Demonstration			\$137,332.00
 LBNL Resource	15-Oct-10	17-Dec-10	\$40,000.00
 PNNL Resource	15-Oct-10	17-Dec-10	\$87,332.00
 SRNL Resource	15-Oct-10	17-Dec-10	\$10,000.00
 ASCEM MasterBaseline.1.1.1.3 Data Management			\$636,228.28
 A2090 Develop Documented Prioritized Set of Data Management Requirements			\$112,034.40
 LBNL Resource	01-Feb-10	14-May-10	\$85,000.00
 PNNL Resource	01-Feb-10	14-May-10	\$27,034.40
 A2110 Design Information System Schema, Provenance, & Metadata			\$116,725.40
 LBNL Resource	15-Mar-10	15-Jul-10	\$82,000.00
 PNNL Resource	15-Mar-10	15-Jul-10	\$34,725.40
 A2130 Identify & Prep Data Needed to Support Phase I Demonstrations			\$88,161.90
 LBNL Resource	17-May-10	03-Dec-10	\$70,000.00
 PNNL Resource	17-May-10	03-Dec-10	\$18,161.90
 A2140 Develop Information System Schema, Provenance, & Metadata			\$126,849.18
17-Mar-10			Page 1 of 8





















































Resource ID	Activity Start	Activity Finish	Budgeted Cost
 LBNL Resource	17-May-10	14-Oct-10	\$95,000.00
 PNNL Resource	17-May-10	14-Oct-10	\$31,849.18
 A2150 Implement Model Data Access Capabilities to Support Phase I Demonstration			\$71,294.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$50,000.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$21,294.00
 A2160 Ingest Data Needed for Phase I Demonstration			\$32,000.00
 LBNL Resource	16-Jul-10	12-Nov-10	\$32,000.00
 A2170 Phase I Demonstration Model Execution & Data Storage Mechanisms			\$89,163.40
 LBNL Resource	15-Oct-10	17-Dec-10	\$64,000.00
 PNNL Resource	15-Oct-10	17-Dec-10	\$25,163.40
 ASCEM MasterBaseline.1.1.1.4 Model Development and Analysis			\$1,305,835.21
 A2700 Define Requirements for Model Setup & Analysis			\$253,930.00
 LANL Resource	01-Feb-10	14-Apr-10	\$111,227.00
 LBNL Resource	01-Feb-10	14-Apr-10	\$75,000.00
 LLNL Resource	01-Feb-10	14-Apr-10	\$50,000.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$17,703.00
 A2710 Document Requirements			\$104,961.99
 LANL Resource	15-Apr-10	14-May-10	\$49,120.00
 LBNL Resource	15-Apr-10	14-May-10	\$30,000.00
 PNNL Resource	15-Apr-10	14-May-10	\$5,841.99
 SRNL Resource	15-Apr-10	14-May-10	\$20,000.00
 A2730 Design Model Setup/Analysis Toolset			\$346,165.40
 LANL Resource	17-May-10	15-Jul-10	\$151,800.00
 LBNL Resource	17-May-10	15-Jul-10	\$100,000.00
 LLNL Resource	17-May-10	15-Jul-10	\$40,000.00
 PNNL Resource	17-May-10	15-Jul-10	\$31,865.40
 SRNL Resource	17-May-10	15-Jul-10	\$22,500.00
 A2750 Implement Model Setup Toolset Prototype			\$59,882.61
 LANL Resource	16-Jul-10	14-Oct-10	\$31,843.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$28,039.61
 A2760 Implement Parameter Estimation Toolset Prototype			\$62,966.00
 LANL Resource	16-Jul-10	14-Oct-10	\$7,966.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$55,000.00
 A2770 Implement Uncertainty Quantification Toolset Prototype			\$114,884.61
 LANL Resource	16-Jul-10	14-Oct-10	\$86,845.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$28,039.61
 A2780 Implement Visualization Toolset Prototype			\$99,255.00
 LANL Resource	16-Jul-10	14-Oct-10	\$21,755.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$55,000.00
 SRNL Resource	16-Jul-10	14-Oct-10	\$22,500.00
 A2790 Implement Model Setup/Analysis Toolset Demonstration			\$263,789.60
 LANL Resource	15-Oct-10	17-Dec-10	\$111,422.00
 LBNL Resource	15-Oct-10	17-Dec-10	\$55,000.00
 LLNL Resource	15-Oct-10	17-Dec-10	\$42,500.00
 PNNL Resource	15-Oct-10	17-Dec-10	\$32,367.60
 SRNL Resource	15-Oct-10	17-Dec-10	\$22,500.00
 ASCEM MasterBaseline.1.1.1.5 Decision Support Toolset			\$129,802.00
 A2190 Define Requirements for Decision Support Toolset			\$35,530.00
 LANL Resource	01-Feb-10	30-Apr-10	\$15,530.00
 LBNL Resource	01-Feb-10	30-Apr-10	\$10,000.00
 SRNL Resource	01-Feb-10	30-Apr-10	\$10,000.00
 A2210 Design Decision Support Toolset			\$41,957.00
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
LANL Resource	03-May-10	30-Jun-10	\$26,957.00
LBNL Resource	03-May-10	30-Jun-10	\$5,000.00
SRNL Resource	03-May-10	30-Jun-10	\$10,000.00
A2230 Implement Decision Support Toolset Prototype			\$27,109.00
LANL Resource	01-Jul-10	30-Sep-10	\$17,109.00
LBNL Resource	01-Jul-10	30-Sep-10	\$5,000.00
SRNL Resource	01-Jul-10	30-Sep-10	\$5,000.00
A2240 Implement Decision Support Toolset Demonstration for Phase I			\$25,206.00
LANL Resource	01-Oct-10	03-Dec-10	\$10,206.00
LBNL Resource	01-Oct-10	03-Dec-10	\$5,000.00
SRNL Resource	01-Oct-10	03-Dec-10	\$10,000.00
ASCEM MasterBaseline.1.1.1.6 Risk Analysis Toolset			\$232,500.00
A2260 Define Risk Toolset Requirements			\$34,280.00
ANL Resource	01-Feb-10	30-Apr-10	\$11,400.00
ORNL Resource	01-Feb-10	30-Apr-10	\$17,700.00
SRNL Resource	01-Feb-10	30-Apr-10	\$5,180.00
A2270 Design Prototype of Risk Toolset			\$34,280.00
ANL Resource	03-May-10	30-Jun-10	\$11,400.00
ORNL Resource	03-May-10	30-Jun-10	\$17,700.00
SRNL Resource	03-May-10	30-Jun-10	\$5,180.00
A2280 Create Prototype of Risk Toolset Production Environment			\$114,601.00
ANL Resource	01-Jul-10	30-Sep-10	\$52,060.00
ORNL Resource	01-Jul-10	30-Sep-10	\$55,401.00
SRNL Resource	01-Jul-10	30-Sep-10	\$7,140.00
A2290 Phase I Demonstration of Risk Assessment Toolset Prototype			\$49,339.00
ANL Resource	01-Oct-10	03-Dec-10	\$15,140.00
INL Resource	01-Oct-10	03-Dec-10	\$20,000.00
ORNL Resource	01-Oct-10	03-Dec-10	\$14,199.00
ASCEM MasterBaseline.1.1.2 HPC Simulator for Multi-Process Models Thrust Area			\$3,568,848.98
ASCEM MasterBaseline.1.1.2.1 HPC Thrust Area Management			\$478,261.98
A2850 Process Models & HPC Framework Thrust Area Management			\$111,855.00
LANL Resource	01-Feb-10	03-Dec-10	\$86,855.00
LBNL Resource	01-Feb-10	03-Dec-10	\$25,000.00
A2860 Process Models & HPC Framework Planning and Implementation Plan			\$309,257.98
LANL Resource	02-Nov-09	29-Jan-10	\$233,807.00
LBNL Resource	02-Nov-09	29-Jan-10	\$35,900.00
LLNL Resource	02-Nov-09	29-Jan-10	\$17,548.98
PNNL Resource	02-Nov-09	29-Jan-10	\$22,002.00
A2870 Process Models & HPC Framework FY11 Planning			\$20,849.00
LANL Resource	29-Jun-10	30-Sep-10	\$10,849.00
LBNL Resource	29-Jun-10	30-Sep-10	\$10,000.00
A2855 Integrated Implementation Plan & Charter for HPC Thrust			\$36,300.00
LANL Resource	01-Mar-10	30-Sep-10	\$36,300.00
ASCEM MasterBaseline.1.1.2.2 Process Models			\$606,691.63
A2310 Collect & Organize Information on Established Process Models			\$154,600.23
LANL Resource	01-Feb-10	14-May-10	\$31,125.00
LBNL Resource	01-Feb-10	14-May-10	\$63,000.00
LLNL Resource	01-Feb-10	14-May-10	\$40,000.00
PNNL Resource	01-Feb-10	14-May-10	\$20,475.23
A2320 Solicit & Incorporate Preliminary Guidance on Site Attributes & Characteristics			\$70,127.40
LBNL Resource	01-Feb-10	14-May-10	\$32,200.00
PNNL Resource	01-Feb-10	14-May-10	\$27,927.40
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
 SRNL Resource	01-Feb-10	14-May-10	\$10,000.00
 A2340 Analyze & Summarize Impact of Site Attributes on Process Models			\$151,200.00
 LANL Resource	17-May-10	14-Oct-10	\$22,438.00
 LBNL Resource	17-May-10	14-Oct-10	\$63,000.00
 LLNL Resource	17-May-10	14-Oct-10	\$17,500.00
 PNNL Resource	17-May-10	14-Oct-10	\$38,262.00
 SRNL Resource	17-May-10	14-Oct-10	\$10,000.00
 A2350 Develop a Prioritization of Process Models for the HPC Simulator			\$141,081.00
 LANL Resource	17-May-10	14-Oct-10	\$17,319.00
 LBNL Resource	17-May-10	14-Oct-10	\$63,000.00
 LLNL Resource	17-May-10	14-Oct-10	\$17,500.00
 PNNL Resource	17-May-10	14-Oct-10	\$38,262.00
 SRNL Resource	17-May-10	14-Oct-10	\$5,000.00
 A2370 Establish Conceptual Models with Site Data for Phase I Demonstration			\$89,683.00
 LANL Resource	15-Oct-10	17-Dec-10	\$16,683.00
 LBNL Resource	15-Oct-10	17-Dec-10	\$63,000.00
 SRNL Resource	15-Oct-10	17-Dec-10	\$10,000.00
 ASCEM MasterBaseline.1.1.2.3 HPC Core Framework			\$1,112,236.97
 A2380 Evaluate & Prototype Existing Frameworks			\$174,811.50
 ANL Resource	01-Feb-10	14-Apr-10	\$28,400.00
 LANL Resource	01-Feb-10	14-Apr-10	\$64,518.00
 LBNL Resource	01-Feb-10	14-Apr-10	\$12,000.00
 ORNL Resource	01-Feb-10	14-Apr-10	\$34,500.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$35,393.50
 A2390 Develop Draft of Requirements for HPC Core Framework			\$144,544.64
 ANL Resource	01-Feb-10	14-Apr-10	\$8,400.00
 INL Resource	01-Feb-10	14-Apr-10	\$5,000.00
 LANL Resource	01-Feb-10	14-Apr-10	\$57,836.00
 LBNL Resource	01-Feb-10	14-Apr-10	\$11,500.00
 ORNL Resource	01-Feb-10	14-Apr-10	\$32,000.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$29,808.64
 A2410 Develop Draft Design for HPC Core Framework			\$159,492.20
 ANL Resource	15-Apr-10	15-Jul-10	\$18,400.00
 LANL Resource	15-Apr-10	15-Jul-10	\$65,519.00
 LBNL Resource	15-Apr-10	15-Jul-10	\$13,500.00
 ORNL Resource	15-Apr-10	15-Jul-10	\$36,500.00
 PNNL Resource	15-Apr-10	15-Jul-10	\$25,573.20
 A2430 Initial Prototype of HPC Core Framework Services/Data Structures			\$449,283.98
 ANL Resource	16-Jul-10	17-Dec-10	\$13,400.00
 INL Resource	16-Jul-10	17-Dec-10	\$11,000.00
 LANL Resource	16-Jul-10	17-Dec-10	\$175,208.00
 LBNL Resource	16-Jul-10	17-Dec-10	\$41,200.00
 ORNL Resource	16-Jul-10	17-Dec-10	\$112,000.00
 PNNL Resource	16-Jul-10	17-Dec-10	\$96,475.98
 A2400 Finalize Initial Requirements of HPC Core Framework			\$184,104.65
 ANL Resource	15-Apr-10	15-Jul-10	\$8,400.00
 INL Resource	15-Apr-10	15-Jul-10	\$5,000.00
 LANL Resource	15-Apr-10	15-Jul-10	\$62,965.00
 LBNL Resource	15-Apr-10	15-Jul-10	\$10,500.00
 ORNL Resource	15-Apr-10	15-Jul-10	\$30,000.00
 PNNL Resource	15-Apr-10	15-Jul-10	\$67,239.65
 ASCEM MasterBaseline.1.1.2.4 HPC Toolsets			\$1,371,658.40
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
 A2450 Evaluate & Prototype Existing Toolsets & Algorithms			\$221,736.48
 LANL Resource	01-Feb-10	14-Apr-10	\$73,668.00
 LBNL Resource	01-Feb-10	14-Apr-10	\$66,000.00
 LLNL Resource	01-Feb-10	14-Apr-10	\$40,000.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$42,068.48
 A2460 Develop Draft of Requirements for HPC Toolsets			\$145,443.20
 LANL Resource	01-Feb-10	14-Apr-10	\$62,505.00
 LBNL Resource	01-Feb-10	14-Apr-10	\$56,400.00
 LLNL Resource	01-Feb-10	14-Apr-10	\$25,000.00
 PNNL Resource	01-Feb-10	14-Apr-10	\$1,538.20
 A2470 Develop Draft Design for HPC Toolsets			\$141,777.40
 LANL Resource	15-Apr-10	15-Jul-10	\$62,701.00
 LBNL Resource	15-Apr-10	15-Jul-10	\$60,000.00
 LLNL Resource	15-Apr-10	15-Jul-10	\$16,000.00
 PNNL Resource	15-Apr-10	15-Jul-10	\$3,076.40
 A2490 Develop Phase I Mesh Interfaces & Data Structures			\$109,449.36
 LANL Resource	16-Jul-10	17-Dec-10	\$42,252.00
 LBNL Resource	16-Jul-10	17-Dec-10	\$23,000.00
 PNNL Resource	16-Jul-10	17-Dec-10	\$44,197.36
 A2500 Implement Initial Solver Interfaces & Components			\$161,543.08
 LANL Resource	16-Jul-10	17-Dec-10	\$81,396.00
 LBNL Resource	16-Jul-10	17-Dec-10	\$52,000.00
 LLNL Resource	16-Jul-10	17-Dec-10	\$15,000.00
 PNNL Resource	16-Jul-10	17-Dec-10	\$13,147.08
 A2510 Develop & Verify Phase 1 Prototype of Flow & Transport			\$165,072.80
 LANL Resource	16-Jul-10	14-Oct-10	\$75,440.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$60,600.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$29,032.80
 A2530 Develop & Verify Phase I Prototype of Geochemistry			\$97,384.60
 LANL Resource	16-Jul-10	14-Oct-10	\$19,933.00
 LBNL Resource	16-Jul-10	14-Oct-10	\$19,000.00
 PNNL Resource	16-Jul-10	14-Oct-10	\$58,451.60
 A2540 Perform Phase 1 Demonstration Simulations on Various Platforms			\$122,134.00
 LANL Resource	15-Oct-10	17-Dec-10	\$66,534.00
 LBNL Resource	15-Oct-10	17-Dec-10	\$55,600.00
 A2465 Finalize Initial Requirements of HPC Toolsets			\$207,117.48
 LANL Resource	15-Apr-10	15-Jul-10	\$73,449.00
 LBNL Resource	15-Apr-10	15-Jul-10	\$62,600.00
 LLNL Resource	15-Apr-10	15-Jul-10	\$29,000.00
 PNNL Resource	15-Apr-10	15-Jul-10	\$42,068.48
 ASCEM MasterBaseline.1.1.3 Site Application Thrust Area			\$1,653,522.00
 ASCEM MasterBaseline.1.1.3.1 Site Application Thrust Area Management			\$209,561.36
 A2820 Site Application Thrust Area Planning & Implementation Plan			\$60,696.00
 LANL Resource	02-Nov-09	29-Jan-10	\$661.00
 LBNL Resource	02-Nov-09	29-Jan-10	\$12,413.00
 PNNL Resource	02-Nov-09	29-Jan-10	\$47,622.00
 A2830 Site Application Thrust Area Management			\$97,652.58
 LBNL Resource	01-Feb-10	03-Dec-10	\$29,646.72
 PNNL Resource	01-Feb-10	03-Dec-10	\$68,005.86
 A2890 Site Application Thrust FY11 Planning			\$17,542.78
 LBNL Resource	29-Jun-10	30-Sep-10	\$5,325.28
 PNNL Resource	29-Jun-10	30-Sep-10	\$12,217.50
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
 A2833 Integrated Implementation Plan & Charter for Site Application Thrust			\$33,670.00
 PNNL Resource	01-Mar-10	30-Sep-10	\$33,670.00
 ASCEM MasterBaseline.1.1.3.2 User Requirements Interface			\$560,317.49
 A2570 Collect User Input for ASCEM Requirements			\$109,139.44
 LBNL Resource	01-Feb-10	30-Apr-10	\$32,522.00
 LLNL Resource	01-Feb-10	30-Apr-10	\$20,000.00
 ORNL Resource	01-Feb-10	30-Apr-10	\$20,000.00
 PNNL Resource	01-Feb-10	30-Apr-10	\$11,617.44
 SRNL Resource	01-Feb-10	30-Apr-10	\$25,000.00
 A2580 Review Plans & Specifications for Platform & HPC			\$101,118.10
 LLNL Resource	01-Feb-10	30-Apr-10	\$37,500.00
 ORNL Resource	01-Feb-10	30-Apr-10	\$20,000.00
 PNNL Resource	01-Feb-10	30-Apr-10	\$23,618.10
 SRNL Resource	01-Feb-10	30-Apr-10	\$20,000.00
 A2590 Collect User Input & Revise Model Review Document			\$155,215.50
 INL Resource	01-Mar-10	30-Jun-10	\$9,000.00
 LBNL Resource	01-Mar-10	30-Jun-10	\$37,496.00
 LLNL Resource	01-Mar-10	30-Jun-10	\$20,000.00
 ORNL Resource	01-Mar-10	30-Jun-10	\$27,500.00
 PNNL Resource	01-Mar-10	30-Jun-10	\$31,219.50
 SRNL Resource	01-Mar-10	30-Jun-10	\$30,000.00
 A2600 Obtain User Feedback on ASCEM Activities			\$75,985.07
 INL Resource	01-Jul-10	10-Dec-10	\$10,000.00
 ORNL Resource	01-Jul-10	10-Dec-10	\$20,000.00
 PNNL Resource	01-Jul-10	10-Dec-10	\$15,985.07
 SRNL Resource	01-Jul-10	10-Dec-10	\$30,000.00
 A2610 Interface with PA CoP, LFRG & Other User Groups			\$118,859.38
 LBNL Resource	25-Jan-10	10-Dec-10	\$37,496.00
 PNNL Resource	25-Jan-10	10-Dec-10	\$11,363.38
 SRNL Resource	25-Jan-10	10-Dec-10	\$70,000.00
 ASCEM MasterBaseline.1.1.3.3 Establish Demonstration Site Attributes			\$420,966.65
 A2620 Establish Draft Matrix of Potential Site Attributes			\$207,298.30
 LANL Resource	01-Feb-10	14-May-10	\$33,484.00
 LBNL Resource	01-Feb-10	14-May-10	\$21,917.00
 ORNL Resource	01-Feb-10	14-May-10	\$90,000.00
 PNNL Resource	01-Feb-10	14-May-10	\$41,897.30
 SRNL Resource	01-Feb-10	14-May-10	\$20,000.00
 A2630 Finalize Matrix of Attributes & Produce Final Report			\$213,668.35
 LANL Resource	17-May-10	03-Dec-10	\$25,112.00
 LBNL Resource	17-May-10	03-Dec-10	\$42,520.00
 ORNL Resource	17-May-10	03-Dec-10	\$70,000.00
 PNNL Resource	17-May-10	03-Dec-10	\$26,036.35
 SRNL Resource	17-May-10	03-Dec-10	\$50,000.00
 ASCEM MasterBaseline.1.1.3.4 Select Demonstration Sites			\$462,676.50
 A2640 Develop Candidate Demonstration Short List			\$54,419.00
 LANL Resource	12-Apr-10	14-May-10	\$13,393.00
 LBNL Resource	12-Apr-10	14-May-10	\$3,380.00
 ORNL Resource	12-Apr-10	14-May-10	\$10,000.00
 PNNL Resource	12-Apr-10	14-May-10	\$17,646.00
 SRNL Resource	12-Apr-10	14-May-10	\$10,000.00
 A2650 Document Candidate Demonstration Short List			\$84,524.80
 LANL Resource	17-May-10	17-Sep-10	\$8,371.00
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
 LBNL Resource	17-May-10	17-Sep-10	\$30,951.00
 ORNL Resource	17-May-10	17-Sep-10	\$15,000.00
 PNNL Resource	17-May-10	17-Sep-10	\$15,202.80
 SRNL Resource	17-May-10	17-Sep-10	\$15,000.00
 A2660 Select Phase I Data Set and Document			\$71,069.50
 LANL Resource	17-May-10	11-Jun-10	\$9,626.00
 LBNL Resource	17-May-10	11-Jun-10	\$12,440.00
 ORNL Resource	17-May-10	11-Jun-10	\$15,000.00
 PNNL Resource	17-May-10	11-Jun-10	\$19,003.50
 SRNL Resource	17-May-10	11-Jun-10	\$15,000.00
 A2670 Prepare Phase I Data Set for Demonstration			\$167,070.00
 LANL Resource	14-Jun-10	14-Oct-10	\$11,719.00
 LBNL Resource	14-Jun-10	14-Oct-10	\$29,945.00
 ORNL Resource	14-Jun-10	14-Oct-10	\$27,500.00
 PNNL Resource	14-Jun-10	14-Oct-10	\$30,406.00
 PNNL Resource	14-Jun-10	14-Oct-10	\$40,000.00
 SRNL Resource	14-Jun-10	14-Oct-10	\$27,500.00
 A2690 Implement Phase I Data Set in Demonstration			\$85,593.20
 LANL Resource	15-Oct-10	17-Dec-10	\$30,134.00
 ORNL Resource	15-Oct-10	17-Dec-10	\$20,000.00
 PNNL Resource	15-Oct-10	17-Dec-10	\$15,459.20
 SRNL Resource	15-Oct-10	17-Dec-10	\$20,000.00
 ASCEM MasterBaseline.1.1.4 ASCEM Management			\$1,771,648.00
 ASCEM MasterBaseline.1.1.4.1 Project Manager			\$1,033,075.98
 A1060 Project Manager and Lab Lead Support			\$494,255.50
 LANL Resource	01-Feb-10	03-Dec-10	\$354,856.32
 LBNL Resource	01-Feb-10	03-Dec-10	\$26,670.45
 ORNL Resource	01-Feb-10	03-Dec-10	\$29,670.45
 PNNL Resource	01-Feb-10	03-Dec-10	\$59,888.28
 SRNL Resource	01-Feb-10	03-Dec-10	\$23,170.00
 A1100 Develop FY10 Implementation & Integrated Project Plan			\$377,826.00
 LANL Resource	02-Nov-09	29-Jan-10	\$215,688.00
 LBNL Resource	02-Nov-09	29-Jan-10	\$116,248.00
 PNNL Resource	02-Nov-09	29-Jan-10	\$16,090.00
 SRNL Resource	02-Nov-09	29-Jan-10	\$29,800.00
 A1110 Coordinate and Develop FY11 Plan			\$62,294.48
 LANL Resource	29-Jun-10	30-Sep-10	\$36,583.68
 LBNL Resource	29-Jun-10	30-Sep-10	\$5,329.55
 ORNL Resource	29-Jun-10	30-Sep-10	\$5,329.55
 PNNL Resource	29-Jun-10	30-Sep-10	\$9,721.70
 SRNL Resource	29-Jun-10	30-Sep-10	\$5,330.00
 A1065 Integrated Implementation Plan & Charter for Project Mgmt			\$98,700.00
 LANL Resource	01-Mar-10	30-Sep-10	\$51,850.00
 LBNL Resource	01-Mar-10	30-Sep-10	\$46,850.00
 ASCEM MasterBaseline.1.1.4.2 Technical Systems Integrator Lead			\$172,000.00
 A1070 Technical Systems Integration Lead Support			\$172,000.00
 LBNL Resource	01-Feb-10	03-Dec-10	\$172,000.00
 ASCEM MasterBaseline.1.1.4.3 User Steering Committee Chair			\$64,200.00
 A1080 User Steering Committee Chair Support			\$64,200.00
 SRNL Resource	01-Feb-10	03-Dec-10	\$64,200.00
 ASCEM MasterBaseline.1.1.4.4 Communication and Websites Lead			\$142,500.00
 A1090 Communication & Websites Lead Support			\$142,500.00
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Resource ID	Activity Start	Activity Finish	Budgeted Cost
 LBNL Resource	01-Feb-10	03-Dec-10	\$142,500.00
 ASCEM MasterBaseline.1.1.4.5 Project Controls and Business Management			\$184,872.00
 A1040 Develop FY10 Implementation & Integrated Project Plan			\$57,291.32
 LANL Resource	07-Dec-09	29-Jan-10	\$44,077.00
 PNNL Resource	07-Dec-09	29-Jan-10	\$13,214.32
 A1050 Project Controls and Business Management Support			\$127,580.68
 LANL Resource	01-Feb-10	03-Dec-10	\$65,795.00
 PNNL Resource	01-Feb-10	03-Dec-10	\$61,785.68
 ASCEM MasterBaseline.1.1.4.6 Quality Assurance			\$175,000.02
 A1000 Develop QA Program Plan			\$12,412.80
 PNNL Resource	04-Jan-10	12-Feb-10	\$12,412.80
 A1010 Review & Resolve Comments on QA Program Plan			\$4,654.80
 PNNL Resource	15-Feb-10	26-Feb-10	\$4,654.80
 A1020 Attain Approval for QA Program Plan			\$775.80
 PNNL Resource	01-Mar-10	26-Mar-10	\$775.80
 A1030 QA Support			\$148,777.98
 PNNL Resource	25-Jan-10	03-Dec-10	\$148,777.98
 A0090 Quality Assurance Project Start-Up and Planning			\$8,378.64
 PNNL Resource	02-Nov-09	31-Dec-09	\$8,378.64
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